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ROAD BUILDERS' NUMBER

January
1929

TECHNOLOGY DEPARTMENT

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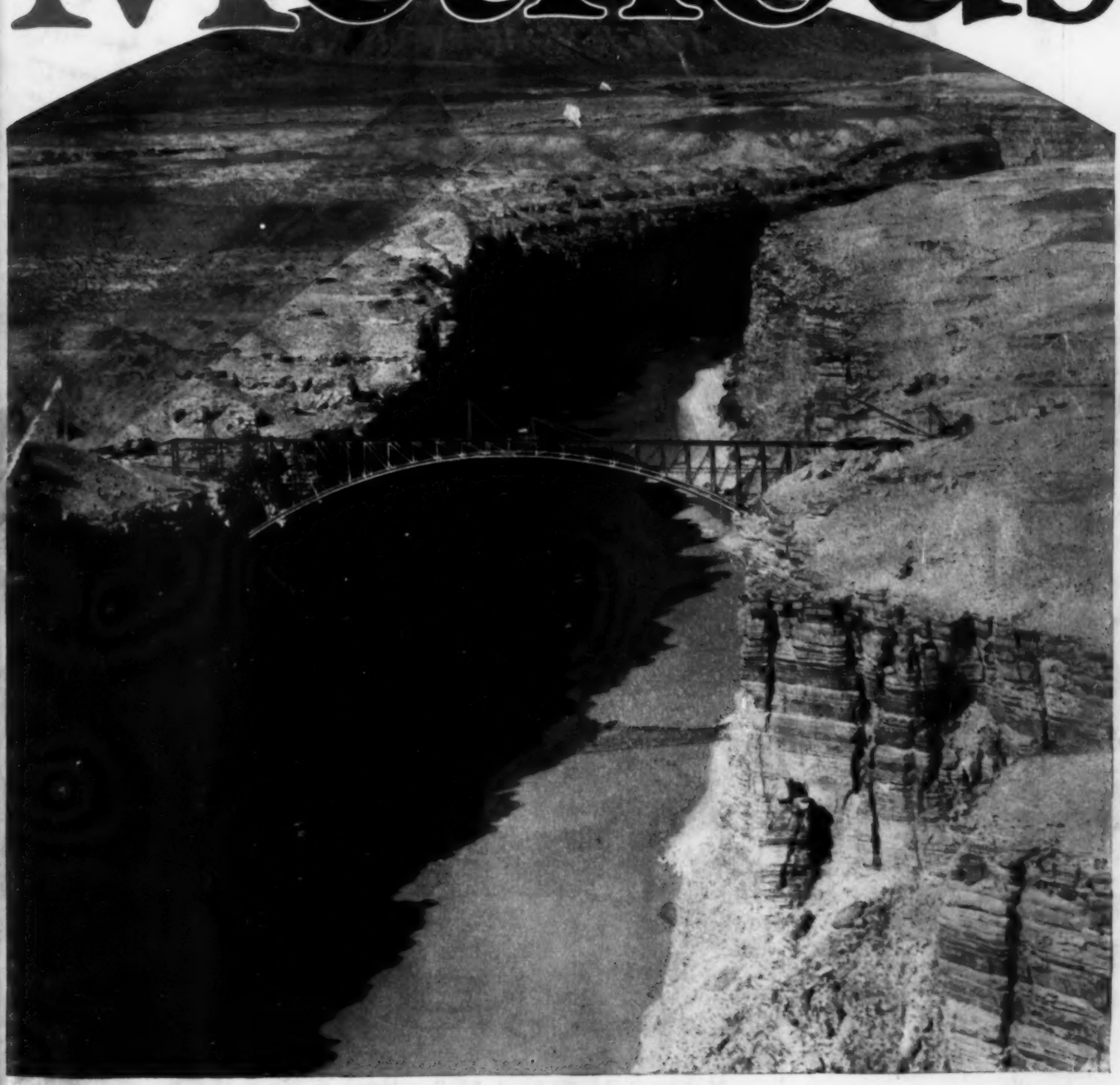
Construction Methods



New Traffic Link Across the Grand Canyon

Arizona Highway Department Builds 616-ft. Arch Span Across Colorado River

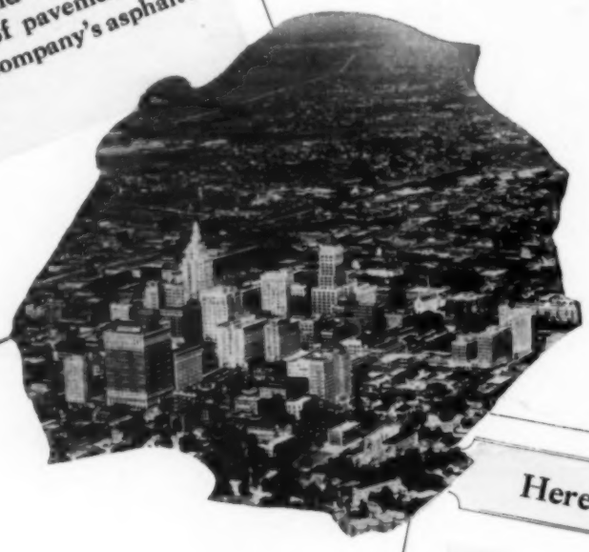
A MONTHLY PICTORIAL OF FIELD PRACTICE AND EQUIPMENT

General Construction • Highways • Buildings • Engineering • Industrial

R v. 11 1929

Do *you* know of such a city?

What city you know of has laid 2,000,000 sq. yds. of pavement with *one* company's asphalt?



Here is one!

Tulsa, Okla., is such a city.

Tulsa constructed its first TEXACO Asphalt pavement in 1908. In the 20 years which followed, that original small TEXACO yardage multiplied again and again, until it has today arrived at the 2,000,000 mark.

Tulsa is one more of the 1400 U. S. cities and towns in which TEXACO Asphalt streets serve traffic.

TEXACO
ASPHALT

New York
Philadelphia
Buffalo
Richmond
Boston

The Texas Company
ASPHALT SALES DEPT.
17 Battery Place, New York City

Jacksonville
Chicago
Cleveland
Kansas City
Houston
Dallas

Construction Methods, January, 1929, Vol 11, No. 1. Published Monthly. McGraw-Hill Publishing Company, Inc., Tenth Ave. at Thirty-sixth St., New York, N. Y. Two years for $1: per copy, 5 cents. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 10, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S.A.

TECHNOLOGY DEPT.

Road Builders' Number

THIS is the annual Road Builders' Number of *Construction Methods,* appearing before the big convention and equipment exhibit at Cleveland of the American Road Builders' Association. While the articles and the pictures deal principally with highway topics, they offer material that is, or should be, of interest to contractors and engineers engaged in other forms of construction. There are three main thoughts that influence us in making this statement:

First, our contact with construction men convinces us that they never neglect the opportunity of broadening their knowledge beyond the limits of their particular specialty. The sewer builder in the Middle West is keenly interested in how New York's subways are built, and the constructor of a Pacific Coast power project is eager for details of how the Mississippi flood menace is to be handled.

This catholicity of construction interest is an actual condition, not a theory. It is readily explained—our second point—by the fact that contractors shift from one kind of work to another. Today's railroad contractor may be tomorrow's highway builder, or vice versa. Realizing the probability of changes in the kind of work they may undertake a few years hence constructors have become desciples of preparedness and make a regular practice of seizing upon and storing up for future use information on methods and plant applicable to work entirely different from that on which they may at present be engaged.

The third and final point is this: While construction may be broken down into a variety of major classes—buildings, bridges, roads, sewers, waterworks, etc.—the methods, the machines and the materials of one group are pretty generally applicable to the others. What difference, fundamentally, is there between tunnels built to carry railroad lines and those for aqueducts of a water supply?

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

PUBLISHED BY
McGRAW-HILL PUBLISHING COMPANY, INC.
TENTH AVENUE AT 36TH ST., NEW YORK

Construction Methods was founded in 1919, under the name *Successful Methods*, by the Manufacturers Publicity Bureau, Inc., of Chicago, representing a group of non-competing manufacturers of construction equipment. Charles R. Thomas, editor of the first few issues, was succeeded by William Jabine.

In 1926 the McGraw-Hill Publishing Company, Inc., of New York, purchased the publication, changing its name to *Successful Construction Methods* in November of that year and to *Construction Methods* in May, 1927.

Robert K. Tomlin was appointed editor of *Construction Methods* in January, 1928. Vincent B. Smith is assistant editor and Nelle Fitzgerald editorial assistant.

Time and again the shrewd contractor has taken from some field other than his own an idea in plant set-up or equipment design and applied it with signal success to his own work.

And so, when we say that this is a "Road Builders' Number," we do not imply that its interest is limited to highway construction and maintenance. In text and picture there are suggestions applicable to many other kinds of construction.

Safety—Performance or Conversation?

It's one thing to coin some snappy "slogan" or post the job with a flock of fancy placards and quite another to effect an actual reduction in the number of accidents on construction work. There's been a lot of *talk* about accident prevention. What are some of the specific things that have *actually been done* to make the job safer for the man in the field?

***Construction Methods* stands ready to work with contractors and construction companies in broadcasting, through its pages, examples of approved safety practice. This journal wants to receive from you photographs illustrating practical accident prevention details that will help your own men as well as those in other organizations make the job safer.**

Here's an opportunity for an exchange of graphic information that will cut the hospital bill—an opportunity to substitute tangible evidence of safety performance for safety "conversation."

Equipment Versatility

ANY one making the rounds of construction jobs these days is impressed not only by the ingenuity of the present-day contractor in the layout and use of plant but also by the versatility of the mechanical equipment available for his work. A case in point is the New Jersey road construction contract described and illustrated on pages 6-8 this month. A pile-driving hammer, of course, is designed and used primarily for driving or pulling piling. But its utility doesn't end there. On the Jersey job William Eisenberg & Sons Company, the contractors, devised a special rig which put a standard pile hammer to work breaking up old concrete paving base. On this kind of work, for which it had never been intended by its designers, it gave an excellent account of itself.

Another similar case was illustrated in last month's issue in connection with the construction of the Upper Delaware collecting sewer for Philadelphia. Here the Henry W. Horst Company took a standard crawler-mounted locomotive crane, generally employed on clamshell bucket or dragline work, and by means of a special mast and tackle-block rig, converted it into a pile-puller which proved to be a big money-saver.

THE EDITOR WANTS TO HEAR FROM *YOU*—The cases cited in the preceding paragraph are only two of scores of other examples of the *versatility* of modern construction equipment. On your own work haven't you employed a machine for some purpose it was never designed to serve? The Editor of *Construction Methods* would like to hear from you about it. A good clear snapshot with a few pencilled notes describing the outfit, mailed to Tenth Ave. at 36th St., New York, will do the trick. Payment at regular rates, of course, for all pictures acceptable for publication.

A WORD TO THE WISE—Be sure to have *Construction Methods* follow you from job to job by advising us *promptly* of changes in your mailing address.

Spend to Save

HENRY FORD has stirred up the animals again by advising boys to "save to spend." Lots of folks seem to fear that he may start the youngsters off on the wrong foot and that they will ride high, wide and handsome on the spending and forget the rest of his counsel.

Maybe so. We hold no brief for Mr. Ford as an advisor to youth. But of *one* thing we are sure. His advice is mighty good medicine for any man whose job is either in production or construction. It's especially good for the engineer and constructor. But with his permission we'd like to turn it around to read "Spend to Save."

Construction practice is progressing rapidly these days. And this progress is largely the result of better materials, better tools and better equipment for construction. The manufacturer of these essentials has become the pace-maker for modern construction. If you doubt this take a good thoughtful look through the advertising pages of this journal.

The constructor that does not keep abreast of what the manufacturer has to offer him may find himself out of the running.

Modern, efficient plant costs money. But money intelligently spent for efficient equipment and improved materials pays big dividends. In such matters we must spend in order to save.

Theodore Roosevelt once said what Ford really means. We think he said it somewhat better.

He said: "Thrift is intelligent spending."

And the engineer or the constructor who wants to keep up with the parade today must develop a knack for "intelligent spending."

Willard Chevalier
Publishing Director

BYERS

RAVENNA-OHIO

Cut to Grade . .

with this wonderful Byers Independent Rope Crowd

Crowd operates not at the shipper shaft with cogs but at either end of the dipper stick with cable. Crowd cable end is wedged at top and retract cable end wedged at the dipper end of the stick. Both cables travel around shipper shaft, down to Byers patented cable saving shock absorbers and then up to the reversible crowd drum where cables are wrapped in opposite directions.

YOU SAY you MUST have a shovel that will respect surveyors' grade stakes? Then watch a Byers shovel cut to grade.

Long, smooth teeth marks—little (if any) hand clean up following the shovel—minimum of variation from grade stakes—it's the Byers Independent Rope Crowd that does it.

Mr. Fredricks, of Klenke-Fredricks, General Contractors, White Plains, N. Y., writes:

"It is just six months ago that the Byers shovel was delivered to us, and we wish to take this opportunity of expressing our satisfaction. We want to tell you that all statements made by you, regarding the qualities of the shovel, were fully justified. Its speed and dependability have made it possible for us to estimate accurately the approximate time needed to finish a job, and as a result we have built up a reputation for promptness and speed, which has been brought to our attention many times.

"Unquestionably the Byers is the speediest shovel on the market and we know from a positive test, that where going was favorable, we have been able to take out as much as 1000 cu. yds. in a day."

THE BYERS MACHINE CO., Ravenna, O.

Sales and Service Throughout the Country

BYERS

Shovels and Cranes

Thor Compressor *and* Paving Breakers Demolishing *Extremely Heavy* Foundation

Look At These Big Chunks of Concrete

Preparatory to moving the large "Our Lady of Lourds" Church from one side of the street to the other, it was necessary for Crowe Bros., Builders and Movers of Chicago, to knock out the extremely heavy foundation. And it had to be done as quickly as possible.

A THOR Compressor, because of its 26% additional air delivery and THOR Paving Breakers, because of their powerful, hard hitting blow, were an ideal combination.

The THOR is the only compressor on the market with the patented Rix Super-Charger, which enables it to deliver 26% more air than any other compressor of the same size on the market.

Another feature of unusual importance is the "unit-type" design of the THOR. Both engine and compressor are mounted on a common crank case, eliminating gears, clutches and couplings. The advantages of this direct-connected design are tremendous and it is responsible for the extremely low upkeep cost every THOR owner enjoys. There are many more features of the THOR that will interest you—such as accessibility of all working parts—one-piece steel frame—and the elimination of vibration. Investigate and compare the THOR with any other compressor before you buy. Get the complete story and then decide. You'll find that you'll be money ahead.

THOR Paving Breakers. Deliver a powerful, hard-hitting blow. Freezing has been eliminated. New steel retainer prevents chisel from dropping out of nozzle. Made in two sizes.

Be sure to visit the THOR Booth, EH-43, at the Road Show, where a cordial welcome awaits you. The new THOR 250 ft. Compressor as well as the 116 ft. Compressor and a complete line of tools will be on display.

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS

GENERAL OFFICES
600 W. Jackson Blvd.
CHICAGO

ELECTRIC TOOLS

Proof no other Gas Unit

CANNELL-CONRAD CONSTRUCTION COMPANY

ROOM [illegible] TODD BLDG.
Fourth and Market Sts.
LOUISVILLE, KENTUCKY

J. V. CONRAD, Sec'y and Treas.

BRANCHES:
CINCINNATI, OHIO
EVANSTON, ILL.
NILES CENTER, ILL.

August 2, 1928

Northwest Engineering Co.
Green Bay, Wisconsin

Attention: Mr. P[illegible]urke

Gentlemen:

Referring to your Northwest Model #104 [illegible]ination Dragline Crane equipped with 6 cylinder Wisconsi[illegible]soline Engine, with accelerated control:

We have had this rig at work for the past two months and are greatly pleased with its operation and [illegible] kept some accurate records of the use of same both as a [illegible]gline and a Clamshell and we find that these records sho[illegible]hat this rig shows that it will handle approximately 18% m[illegible]excavation when the operator uses the accelerated control o[illegible]and above the yardage he handles when the accelerated is [illegible] out. It speeds up both the hoisting and swinging operatio[illegible]and is especially very efficient on Clamshell operations [illegible]n the bucket is being hoisted out of a sheeted or braced tre[illegible]. In other words the operation in clamming has the same a[illegible]n in regard to speed that you would have with a steam rig [illegible]en the throttle could be thrown open and a full head of st[illegible]m given to the engine which gives you speed in action.

I know of [illegible] other Gas Unit that can be compared with this rig for speed.

I think that you have solved the trick that gives us the speed that we are all after.

Very truly yours,

Cannell-Conrad Construction Co.

Thos. E. Cannell
President

The NORTHWEST VARIABLE SPEED MOTOR accelerator controlled

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline and electric powered cranes, shovels and draglines

1723 Steger Bldg. 28 E. Jackson Blvd. Chicago, Ill., U. S. A.

CM1-Gnw

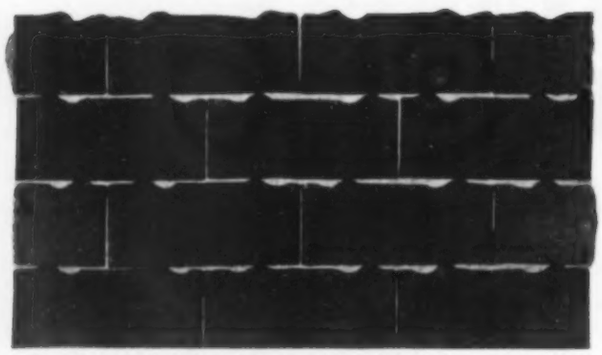
Pennsylvania *faces the future*

THE State of Pennsylvania is now paving approximately 14 miles of the William Penn Highway in Washington County, extending to the West Virginia State line, with Mack-Dunn Wire Cut Lug 3 in. Vitrified Fire Clay Paving Brick.

The State of Pennsylvania also has just completed approximately 32,000 square yards of paving in the boroughs of Carnegie and Canonsburg, Pa. with the same type of brick.

Photographs show the laying of BRICK on the William Penn Highway, Washington County, Penn. Write for data on the service records of BRICK for pavements and roadways the country over.

—pave with brick



Alignment of Mack-Dunn Wire Cut Lug Brick in Courses Showing Uniform Spacing for Filler

Manufactured by

CRESCENT BRICK COMPANY

General Offices—Empire Building, Pittsburgh, Pa.

Eastern Sales Agents:

CENTRAL CLAY PRODUCTS COMPANY
101 Scott St., Wilkes-Barre, Pa.

Works:

Freedom, Pa.; Ellwood City, Pa.; New Cumberland, W. Va.

LAKEWOOD CONCRETE PLACING EQUIPMENT

Marshall-Field Gardens Apartment — The Rosenthal-Cornell Company of Chicago, Contractors.

More Yards per Day
. . . . *Every Day*

EIGHT seconds—and a full batch is discharged. Eight seconds—and the stream line skip has a full batch in the drum. Real one-man operation assured by grouping all operating levers at the drum end of the machine where the operator can SEE what he is doing. Lakewood 10-S Mixers are replacing the older, slower machines.

The Rosenthal-Cornell Company of Chicago used seven 10-S Lakewood machines on this job. They appreciate the difference.

AMERICAN ROAD BUILDERS ASSOCIATION
1929 CONVENTION and ROAD SHOW JANUARY 14 TO 18 INCLUSIVE CLEVELAND OHIO

Bulletin 20-R gives all the details. Send for your copy.

EXPORT OFFICES: 30 Church St., New York City • • *CABLE ADDRESS:* Brosites

LAKEWOOD

The Lakewood Engineering Co., CLEVELAND · O.

"DOMESTIC" ROAD BUILDERS' PUMP

"A 500 lb. pressure pump with the Guaranteed Crankshaft"

Visit our Display Booth WW-22

Road Show Cleveland, Ohio Jan. 14-18

The Greatest Pump Value on the Market

This GIANT among Pumps is a boon to Road Builders.

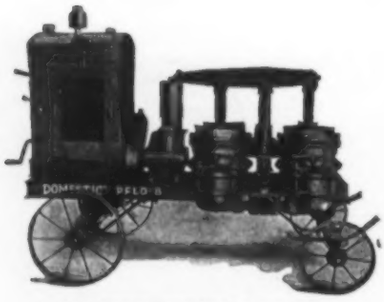
Strong enough to work 24 hours daily against pressures up to 500 lbs.; large enough to deliver 80 or even 100 gallons of water per minute; so free from bearing friction (ball bearings on all drive shafts) that the power losses are negligible; so automatically oiled that once a day inspection only is necessary and so rugged that *We Guarantee* the mighty *Crank Shaft Against Breakage for One Year.*

This GIANT Triplex Pump has been on the market 3 years and hundreds are now in use and in only two cases has our unqualified Guarantee of Crankshaft called for replacements. Some of these GIANT Pumps have operated for months *continuously,* 24 hours a day 7 days a week, and often at pressure 150 lbs. above our guaranteed pressure of 500 lbs.

No piece of Road Equipment is as Important as the Pump, nor subjected to such gruelling Constant Duty.

Accept no substitutes—insist on a "Domestic" GIANT. It is mounted on Spring type Trailer Truck.

"A 'Domestic' Dependable Pump for every Contractor's Needs"



"DOMESTIC" VERTICAL PLUNGER DEWATERING FORCE PUMPS

for handling water from sewers, trenches, drainage points, etc.

"DOMESTIC" IMPROVED CENTRIFUGAL PUMP UNITS

Capacities—250 to 800 gallons per minute. This Pump furnished with Automatic Primer at nominal extra cost.

"DOMESTIC" MODEL 164 DOUBLE DIAPHRAGM PUMP

for open spout pumping—and for temporary force discharge duty our special Force Discharge Attachment is quickly and easily attached.

DOMESTIC ENGINE & PUMP CO., N. Queen St., & P.R.R., SHIPPENSBURG, PENNA.

C.M. 1-29

On Pennsylvania's biggest highway job

If you have anything whatever to do with Pennsylvania road work, you undoubtedly know all about the Horn concern— William C. Horn Co. of Lock Haven, Pa., who have built many miles of highways in and around Pennsylvania, and are now handling the biggest job ever let by the State Highway Department.

They have had mountain contracts with heavy grading through solid rock— and have had such excellent results in the past with 4 Gas+Air BUCYRUS-ERIES in rock digging, that they've now

bought another Gas+Air (their 5th)

making a total of nine BUCYRUS-ERIES bought by the Horn organization.

And they write: "The way these Gas+Air machines handle rock is almost unbelievable. We would not consider any other make of shovel, and highly recommend the Gas+Air for hard service."

BUCYRUS ERIE

The Gas Shovel that has no equal for Big Production

For the steady big output that means profits on work as competitive as highway grading, cellar and foundation excavation, etc., the Gas+Air BUCYRUS-ERIE is without a rival. The direct-connected engines for crowding and swinging, driven by air— always in gear for *instant* action — give the extra speed in each digging cycle that produces outputs no other gasoline shovel can approach.

And it stands right up to the faster pace it sets; the Gas+Air BUCYRUS-ERIE is built with a big extra margin of reliability for hard work.

Write us for some of the remarkable reports from owners, on Output and Upkeep— showing what you can expect.

BUCYRUS-ERIE COMPANY

Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind.
General Offices: South Milwaukee, Wis.

BRANCH OFFICES:

Boston	Atlanta	Buffalo	St. Louis
New York	Birmingham	Detroit	Dallas
Philadelphia	Pittsburgh	Chicago	San Francisco

Representatives and Service throughout the U. S. A. and Canada
Offices and agencies in all principal countries throughout the world

"CATERPILLARS"

REG. U.S. PAT. OFF.

Stick

to

the

job

On good roads . . . bad roads . . . or no roads at all, Caterpillar Tractors will stick to the job. Sure, firm traction balanced with great power sends the Caterpillar through, regardless of weather, footing or the toughness of the work. Get all the profit out of the job with Caterpillar Tractors.

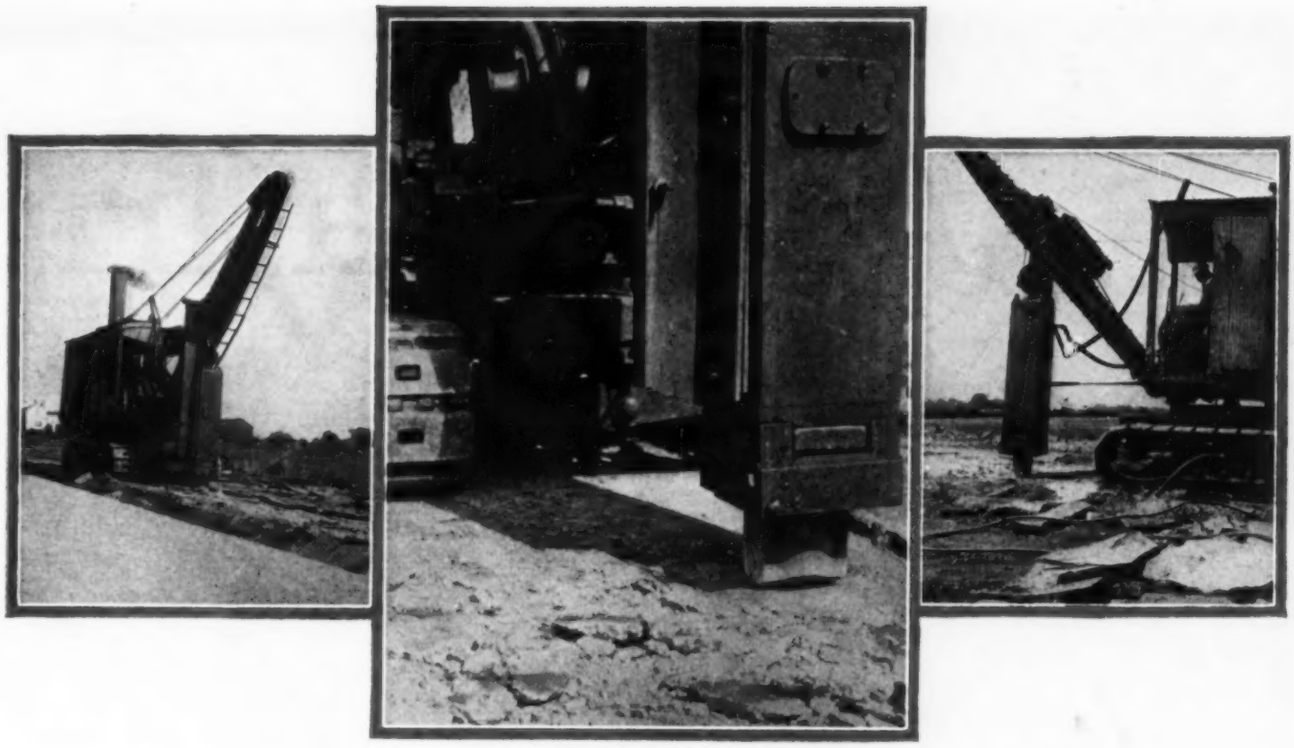
CATERPILLAR TRACTOR CO.

Executive Offices: San Leandro, California, U. S. A.

New York Office: 50 Church Street

Sales Offices and Factories:

Peoria, Illinois San Leandro, California



A new Pile Hammer application to Highway Work

A new and important application of McKiernan-Terry pile hammers is exemplified in the illustrations shown on this page. Here a highway contractor was required to remove 5½ miles of road 18 ft. in width. The sub base of the highway was of concrete 6 in. in thickness surfaced with asphalt. A McKiernan-Terry 9B2 pile hammer, with a special base attachment, was mounted on the boom of a tractor shovel, and broke up successfully the surfacing and concrete base at the rate of 1000 lin.ft., 9 ft. wide every 8 hours. It will be observed from the photographs the fragmentation of the concrete. The spoil was all readily handled by the steam shovel after the demolition by the hammer had been completed. With a force of comparatively few men this method of road breaking completed the work in only a fraction of the time it would have been done by any other method and without the use of explosives.

McKIERNAN-TERRY DRILL COMPANY, 14 Park Row, New York

Pile Hammers and Accessories, Drilling Machinery

Works at Dover, N. J.

PENN TRACTOR & EQUIPMENT CO.
Front & Brown Sts., Philadelphia
BECKWITH MACHINERY CO.
Pittsburgh, Pa.
BORCHERT-INGERSOLL, INC.
St. Paul—Duluth
THE DAY & MADDOCK CO.
Cleveland
FUNKHOUSER EQUIPMENT CO.
Kansas City—Oklahoma City
B. H. HYLAND CO.
Chicago
OLE K. OLSEN
New Orleans
GEO. F. SMITH CO.
St. Louis
E. R. BACON CO.
San Francisco
CLYDE EQUIPMENT CO.
Portland, Ore.—Seattle
GARLINGHOUSE BROS.
Los Angeles
J. W. BARTHOLOW CO.
Dallas—Fort Worth
J. P. BENJAMIN
Jacksonville
BRANDEIS MACHINERY & SUPPLY CO.
Louisville
CAROLINA CONTR. EQUIP. & SUPPLY CO.
Columbia, S. C.
D. C. ELPHINSTONE, INC.
Baltimore
R. B. EVERETT & CO.
Houston
THE GALIGHER CO.
Salt Lake City
McNIELLY MACHINERY CO.
Columbus, O.
TURNER SUPPLY CO.
Mobile
YANCEY BROS.
Atlanta
YANCEY TRACTOR CO.
Albany, Ga.
JOS. S. POTTS, JR. & CO.
Richmond
H. W. SYKES
Norfolk
H. B. TREVOR CO.
Buffalo
HUNTER MACHINERY CO.
Detroit—Grand Rapids
WILSON-WEESNER-WILKINSON CO.
Nashville
HEDGE & MATTHEIS
Boston—Springfield, Mass.
Providence—New Haven

Foreign Representatives:

THE BRITISH STEEL PILING CO., LTD.
London, England

DRIVE

McKIERNAN-TERRY

The Pioneer Double-Acting Hammers

PULL

"An Extra Trip

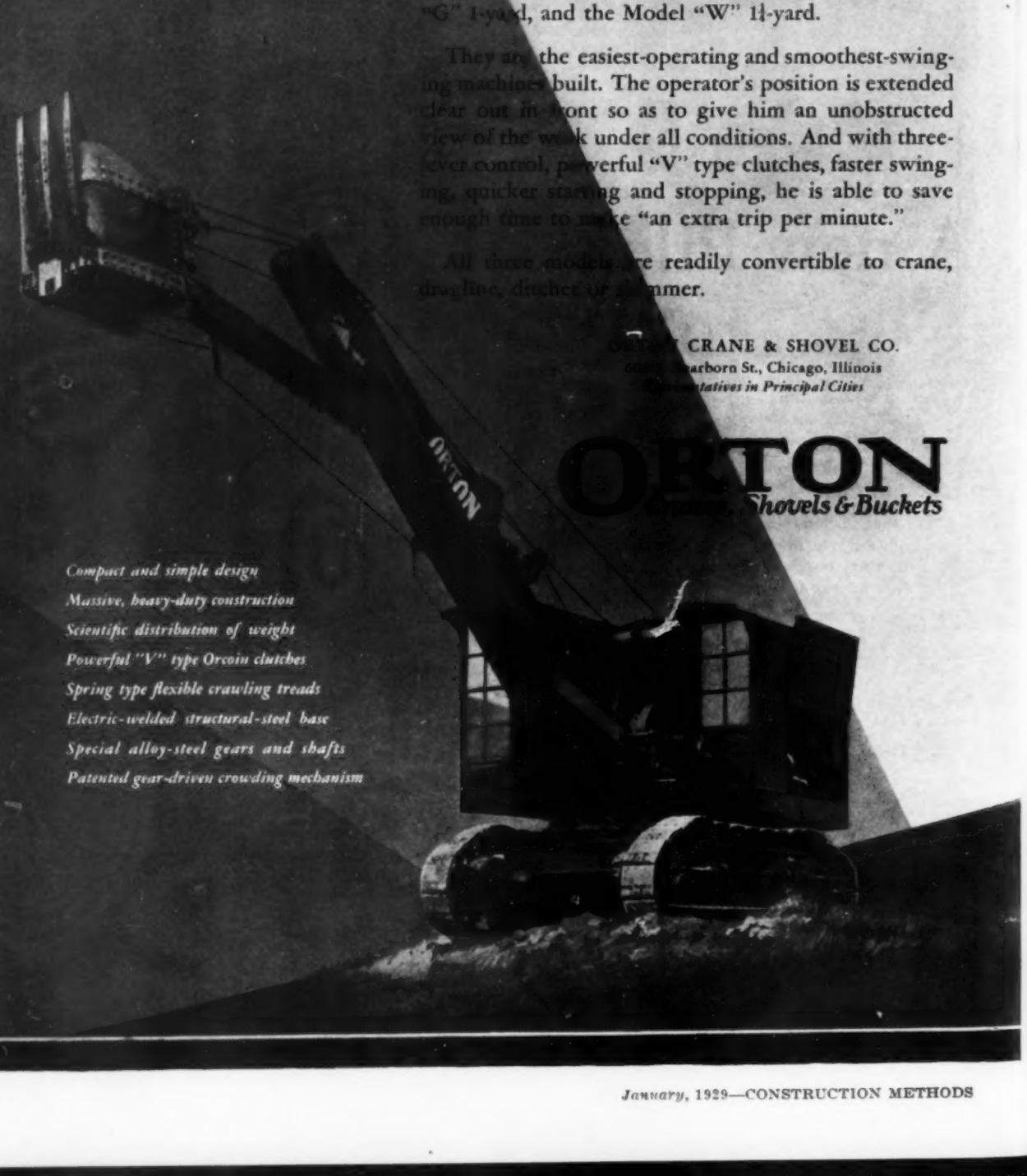
Never before have the demands of modern contractors for excavating and material-handling equipment that will give increased production and continuous service been fulfilled so well as by the new line of ORTON convertible shovels—the Model "A" ¾-yard, the Model "G" 1-yard, and the Model "W" 1¼-yard.

They are the easiest-operating and smoothest-swinging machines built. The operator's position is extended clear out in front so as to give him an unobstructed view of the work under all conditions. And with three-lever control, powerful "V" type clutches, faster swinging, quicker starting and stopping, he is able to save enough time to make "an extra trip per minute."

All three models are readily convertible to crane, dragline, ditcher or skimmer.

ORTON CRANE & SHOVEL CO.
Dearborn St., Chicago, Illinois
Representatives in Principal Cities

ORTON
Shovels & Buckets

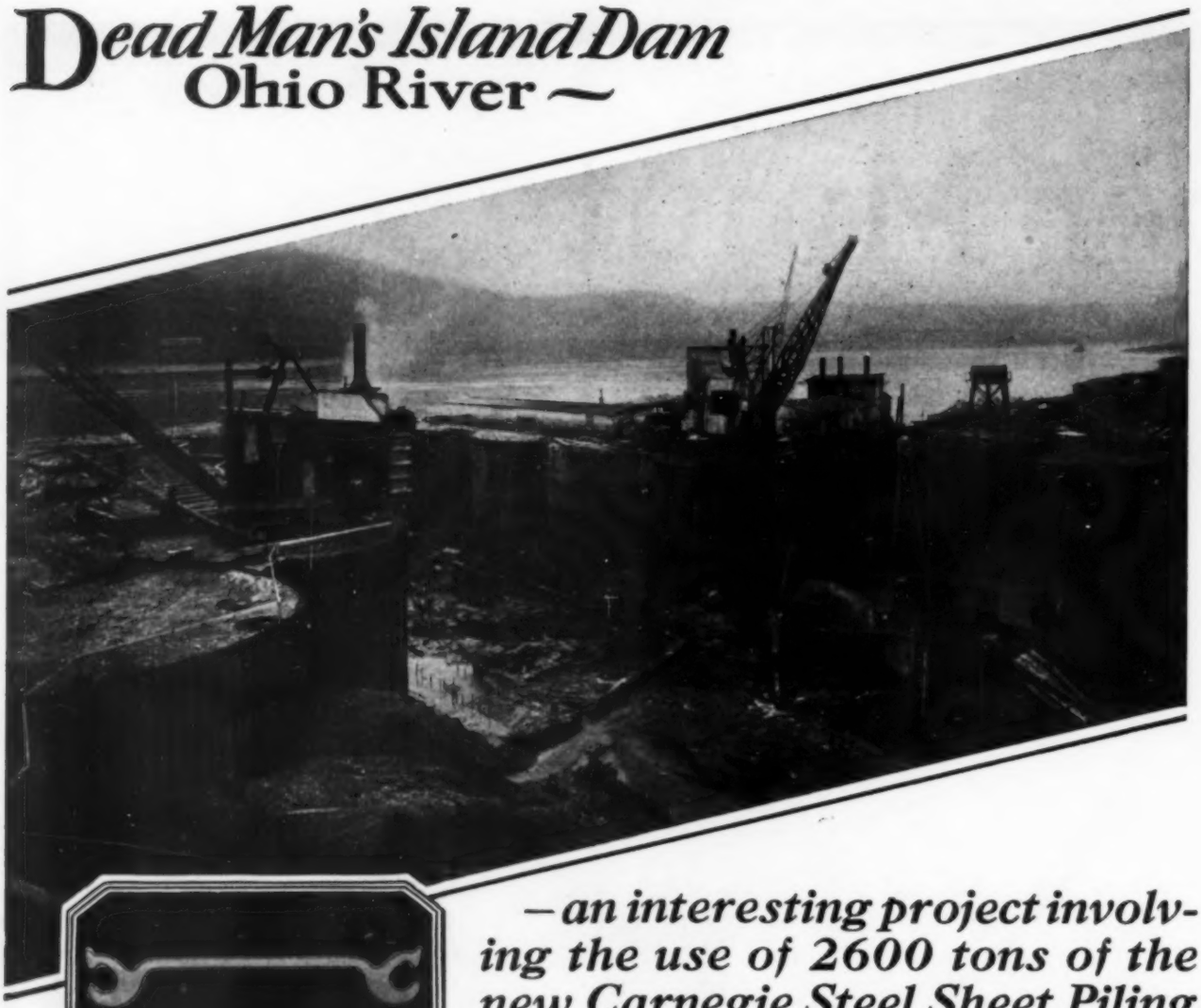


Compact and simple design
Massive, heavy-duty construction
Scientific distribution of weight
Powerful "V" type Orcoin clutches
Spring type flexible crawling treads
Electric-welded structural-steel base
Special alloy-steel gears and shafts
Patented gear-driven crowding mechanism

p per Minute"

ORTON machines are manufactured in five sizes, ranging from ¾-yard on a 30-foot boom to 2 yards on a 60-foot boom, and unbiased recommendations can be made as to the proper size and type for any specific excavating or material-handling purpose.

Dead Man's Island Dam
Ohio River ~



Carnegie Straight Web Piling Section M-107 was selected for this job. Its driving width is 15". Weight per square foot of wall, 30.9 lbs. Web thickness, 5/16". Carnegie Section M-108 is a similar section, but with web thickness of 1/2". Sections M-106 and M-109 are deep arch web sections and are especially designed for light weight and high lateral strength.

—an interesting project involving the use of 2600 tons of the new Carnegie Steel Sheet Piling

The photograph above shows the first unit in the construction of the Dead Man's Island Dam on the Ohio River, near Leetsdale, Pa. The Dravo Contracting Company, who were awarded the job by the government, are using the filled cellular cofferdam type of construction, the first time this method has been employed for dams on the Ohio River. The cofferdam pictured is 383 feet long and is one of six that will stretch across the river. Each cell is 40' in diameter and is tied by two short connecting walls to the adjoining cell. The advantage of this type of construction is that no bracing is necessary, the cells standing of their own weight. Each cell is composed of 102 pieces of Carnegie Steel Sheet Piling, Section M-107, in 40' lengths. The piling is driven to solid rock. This straight web section was chosen because it is particularly adaptable to cellular construction where loads are applied inside of the wall, and where the interlocks are in tension.

Carnegie Steel Sheet Piling is rolled in four different sections to meet your every requirement.

Your Inquiries Are Invited.

CARNEGIE STEEL COMPANY

Subsidiary of UNITED STATES STEEL CORPORATION

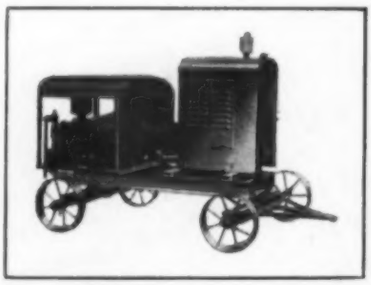
CARNEGIE BUILDING ··· *PITTSBURGH, PA.*

A Mouthful at Every Bite
—or, say it any way you wish . . . capacity loads at every grab—more work in less time—a bigger day's work than with any other bucket of the same weight and capacity. But, only an Owen Bucket underwrites such efficiency. That's why, with an Owen, you can write your own guarantee.
Details of the Owen Type "M" Digger (illustrated here) and other Owen Buckets are explained in the Owen Catalog. Send for it.
THE OWEN BUCKET COMPANY
6023 Breakwater Avenue
Cleveland, Ohio
OWEN
OWEN
CLAMSHELL BUCKETS
INSURE A BIGGER DAY'S WORK
Owen Buckets

Going to the Road Show?

Then Be Sure to Stop at Booth No. WW-4 and See How Novo is Setting the Standards for 1929

Are You a Road Contractor Highway Engineer?



Novo Flud Oild Road Pumps

Here are three big points you'll want to investigate.

First—the high speed operation—that licks "water hammer," which is so destructive to pipe lines.

Second — totally enclosed running in oil operation that means long life.

Third — the new Novo Water Governor that maintains a constant pressure in the pipe line, always—and saves 15 to 25% gasoline.

Also see the new Novo Diaphragm and Centrifugal Pumps.

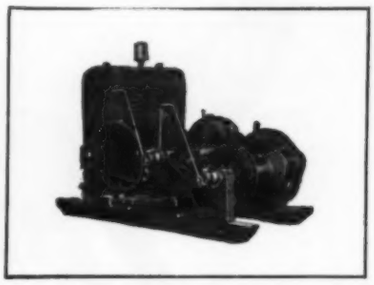
Are You a Manufacturer of Powered Equipment?

Novo Rollr Engines
1, 2 and 4 cyl.—1½ to 16 H. P.

Ask to see a Novo 2 Cyl. Rollr Engine that can operate at 1200 r. p. m. with a pencil balanced on top. See how vibration has been practically eliminated — how Novo Engines can lengthen the life and provide for smoother operation of the equipment you build.

Then check Novo Rollr Engines for extra horse power—lower gas consumption—quarter turn cranking—compactness—durability and other important points.

Are You a General Contractor or Pit Operator?



Novo Gasoline Hoists

Ask to see the test that proves the much greater strength and stiffness of Novo welded, tubular hoist frames.

The extreme rigidity of Novo Hoists prevents out-of-alignment—reduces bearing wear—adds many years of service—and increases operating efficiency.

And because Novo Hoists are welded throughout, they are extremely solid — lighter in weight—and free from rivets that are likely to become loose.

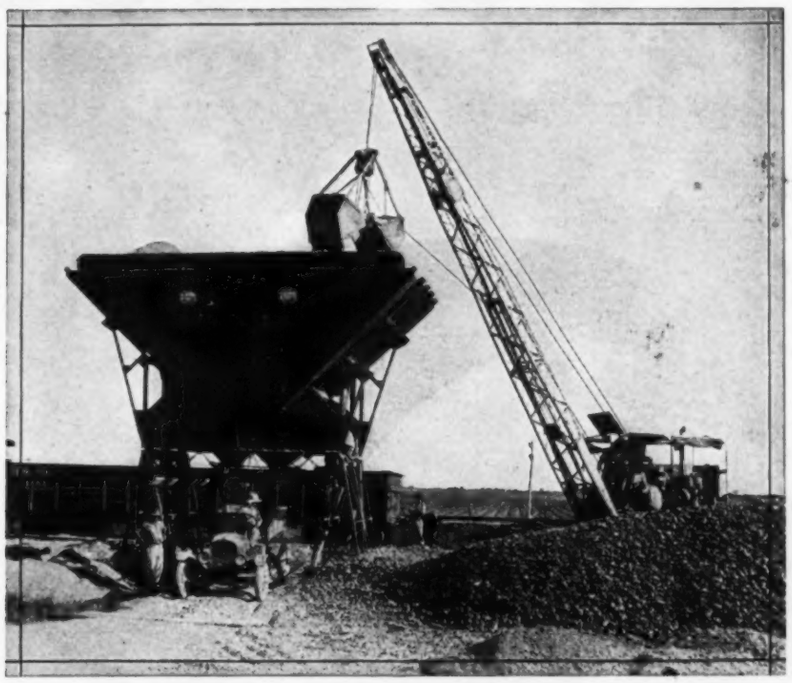
NOVO ENGINE COMPANY, 214 Porter St., Lansing, Mich.
CLARENCE E. BEMENT, Vice-Pres. and Gen. Mgr.

NOVO

PUMPS — ENGINES — HOISTS

Service, parts and sales in 65 cities

"HERCULES" RED-STRAND
REG. U.S. PAT. OFF.
WIRE ROPE



For Economical Wire Rope Service

The exceptional strength and sturdiness of "HERCULES" (Red-Strand) Wire Rope enables it to handle a large tonnage for each dollar of its cost, and its dependability eliminates unexpected and costly tie-ups.

Furthermore, "HERCULES" (Red-Strand) Wire Rope is made in both Round Strand and Patent Flattened Strand constructions in order to meet all working conditions. We recommend it especially for use on cranes, derricks, dredges, excavators, hoists and shovels.

If you will tell us how you use wire rope, we shall be glad to suggest the construction we consider best for your work. Your inquiry will not obligate you in the least, and it may lead to a big saving. We would appreciate hearing from you.

AMERICAN ROAD BUILDERS' ASSOCIATION
1929 CONVENTION AND ROAD SHOW JANUARY 14 TO 18 INCLUSIVE CLEVELAND OHIO

Made Only by **A. Leschen & Sons Rope Co.** *Established* 1857

5909 Kennerly Avenue

ST. LOUIS

New York Chicago Denver San Francisco

DETROIT PUBLIC LIBRARY

ACCEPT NO SUBSTITUTE

Sterling

"perfect balance"—the load is carried over the wheel not on the arms.

More capacity loads per man per day means more work and more real profit.

Sterling designed their barrow to *carry the load over the wheel,* when in a wheeling position, and not on the arms. With a Sterling the man *pushes* the load, not carries it. In actual weight-lifting tests it has been proven that it requires less strength per equal load to lift and wheel a Sterling than any other. This feature is not found in ordinary barrows—and is only possible in a Sterling because of scientific designing of tray and supporting braces.

The "perfect balance" gives position—the *ease of wheeling* is the result of specially designed wheel and axle fitted with "self-lubricating" bearings. The bearings are guaranteed for life—no oil service ever needed. Sterlings wheel as easy when they're old as when they are new.

Wheelers like to work with a Sterling—try them on your next job and see how much more work you get out of them.

Buy by Sterling name—leading hardware and equipment dealers have them or they can get them quickly from our complete stock warehouses at Chicago, New York, Philadelphia, Pittsburgh, Cleveland, Detroit, St. Louis

SPECIAL STERLING FEATURES

Self-lubricating bearings
10-spoke wheel
Malleable iron brackets
Smooth wheel face
Wrought steel hub
Riveted and cast to hub spokes
Fixed rolled steel axle
"V" front tray braces
Selected maple handles
Special tubular steel handles
Handles clamped—not bolted
Top of tray reinforced
Channel steel legs
Riveted leg braces
Extra leg shoes
Wrought iron handle tips

All parts interchangeable

STERLING WHEELBARROW COMPANY

STERLING ON A WHEELBARROW MEANS MORE THAN STERLING ON SILVER

Milwaukee Wisconsin

Here's Something New

An unbreakable warning signal for construction work that will not blow out in heavy winds and rain—in fact, the harder it blows the better it burns.

THE TOLEDO TORCH

equipped with the

Economy Burner

Patents Pending

Illustrating the "Leader"

Regardless of what you have known about torch protection in the past, you will be surprised with the performance of this new burner. Exhaustive tests under most severe conditions of actual service show an increase in effectiveness with a

fuel saving of over 50%

Those who have experienced the many economies Toledo Torches have brought in the past, will find it hard to see where further economy could be effected. Yet, here, with wonderful saving in fuel, there is also practically

no wick consumption

Ask your dealer for

The Toledo Torch "Leader"

Other models for every purse and purpose.

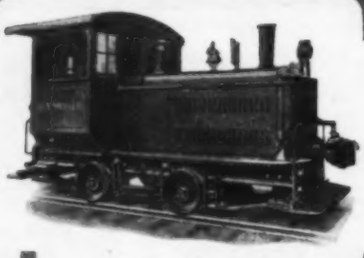
If you are now using Toledo Torches it will pay you to equip them with this remarkable burner. An adapter makes them interchangeable.

Full particulars sent upon request.

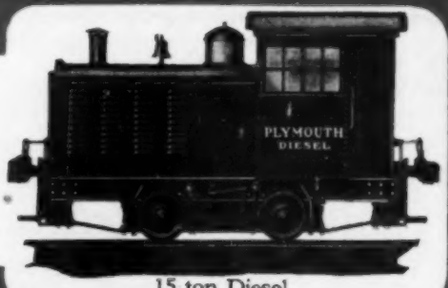
The Toledo Pressed Steel Co.

Toledo, Ohio

12 ton Gasoline



14 ton Gasoline



15 ton Diesel

12 ton Diesel

from 2 to 60 Ton Sizes

8 ton Gasoline

5 ton Gasoline

4 ton Gasoline

2 ton Gasoline

With twenty-four standard Gasoline and Diesel Gear Driven Models together with Gasoline and Diesel Electric models in the larger sizes, there's a Plymouth to solve your haulage problem and solve it the typically Plymouth way—economy and efficiency above all.

Each size and model a sturdy, rugged, trustworthy power unit—representing that excellence in engineering and design which is dominant in Plymouth Locomotives.

Like certain names in other fields of engineering, synonymous of the best, the name Plymouth also stands out in front in the field of industrial locomotives, and justly so, as proven by the testimony of users year after year on their economy, long life and lasting satisfactory performance.

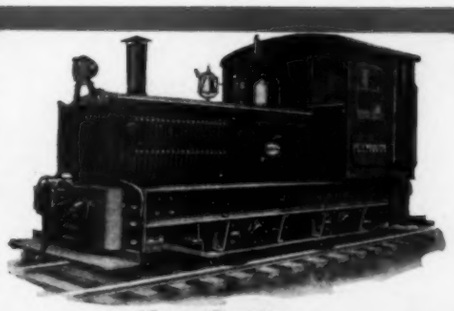
As builders of both Gasoline and Diesel Gear driven Locomotives, as well as Gasoline and Diesel Electrics, we are in a position to give you an unbiased recommendation of the type of locomotives best adapted to your needs.

When you pay the price of Plymouths for locomotives, you deserve Plymouth Quality.

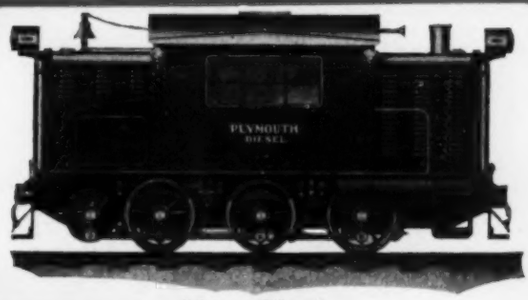
PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
299 Riggs Avenue
PLYMOUTH, OHIO

PLYMOUTH
GASOLINE AND DIESEL

SEE OUR EXHIBIT AT THE 1929 ROAD SHOW, CLEVELAND, OHIO, JAN. 14-18.



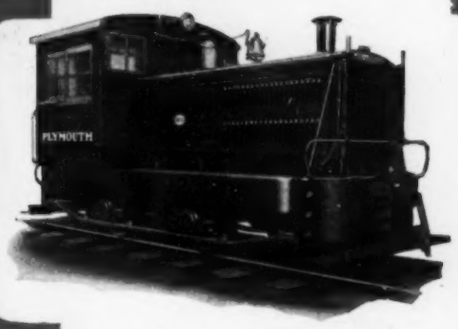
18 ton Gasoline



35 ton Diesel

PLYMOUTH GASOLINE AND DIESEL GEAR DRIVEN LOCOMOTIVES ARE BUILT IN THE FOLLOWING STANDARD SIZES:

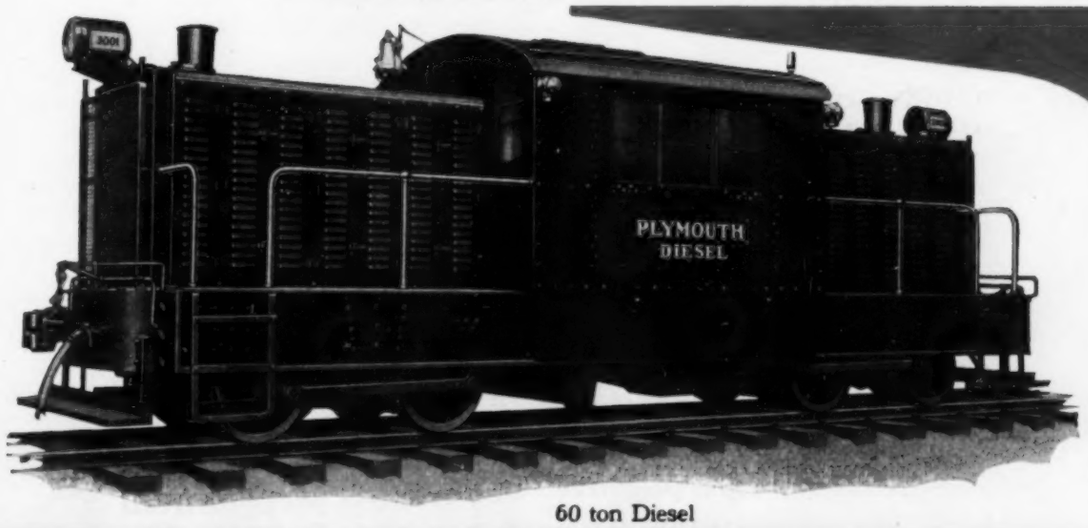
2 ton Gasoline	8 ton Gasoline	20 ton Gasoline
2½ ton Gasoline	10 ton Gasoline	20 ton Diesel
3 ton Gasoline	10 ton Diesel	25 ton Gasoline
4 ton Gasoline	12 ton Gasoline	25 ton Diesel
4½ ton Gasoline	12 ton Diesel	30 ton Gasoline
5 ton Gasoline	14 ton Gasoline	35 ton Diesel
6 ton Gasoline	15 ton Diesel	50 ton Gasoline
7 ton Gasoline	18 ton Gasoline	60 ton Diesel



25 ton Gasoline

Gas Electric and Diesel Electric Locomotives from 12 ton to 60 ton sizes

50 ton Gasoline



60 ton Diesel

LOCOMOTIVES

GAS ELECTRIC AND DIESEL ELECTRIC

SEE OUR EXHIBIT AT THE 1929 ROAD SHOW, CLEVELAND, OHIO, JAN 14-18.

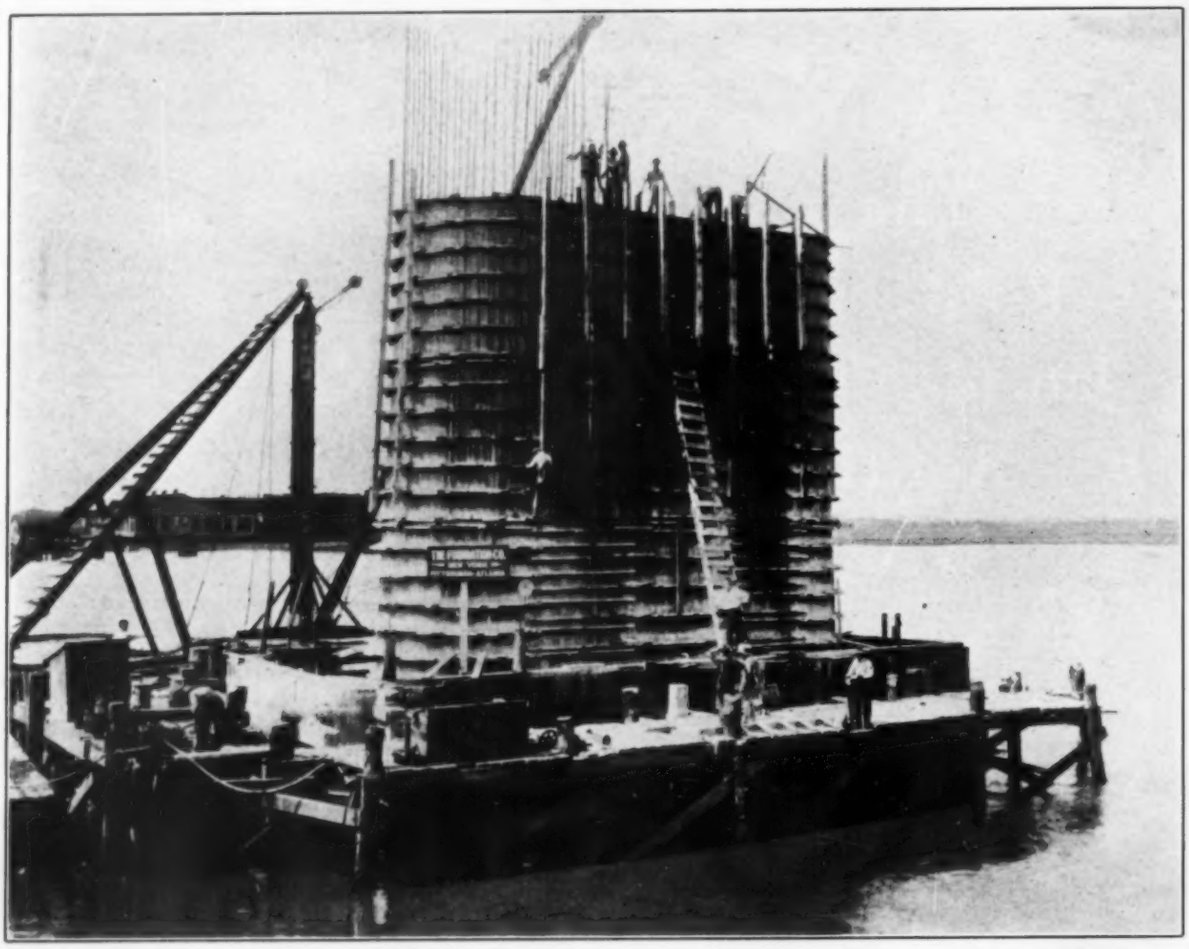
Products that are QUALITY-PROVEN

OUT in the field of actual construction and industry, where products are tested and valued, Republic has established an enviable reputation. The remarkable records of endurance, economy and efficiency established, have caused a steady expansion of business and an increasing demand for Republic Rubber products. The production of high standard merchandise only has meant the use of the best type of skilled craftsmanship, wide awake research and the highest grades of materials. An efficient distributor sales plan has aided in maintaining high quality while allowing comparatively lower prices for the consumer. Among those who know rubber and appreciate exceptional service-results, the terms "Republic" and "first quality mechanical rubber goods" are synonymous.

THE REPUBLIC RUBBER CO.
Youngstown, Ohio

BELTING + HOSE + PACKING + MOLDED GOODS + LATHE CUT GOODS

At
The
Road Show
Jan. 14-18, 1929
Booth
W W
11
Marion Exhibits the New
Type 450, 1¼ cu. yd.
Diesel Electric Shovel
THE fuel economy and convenience of the Diesel coupled with the flexibility and fine operating characteristics of steam! The fartherest advance in the application of internal combustion engines to excavating service! Make a note NOW to see this product of the world's largest manufacturer of electric shovels.
THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.
MARION
TYPE
450
Fuel Oil for
Power
Electricity for
Flexibility
29001
MARION



Channel Pier, Cooper River Bridge *Charleston, S. C.*

Cooper River Bridge Company
The Foundation Company
Contractor for Channel Piers

Another link in the coastal highway is under construction. The bridging of the Cooper River at Charleston, South Carolina, is a part of the system, and The Foundation Company is building the piers upon which the channel spans will rest.

THE FOUNDATION COMPANY

CITY OF NEW YORK

Office Buildings - Industrial Plants - Warehouses - Railroads and Terminals - Foundations
Underpinning - Filtration and Sewage Plants - Hydro-Electric Developments - Power Houses
Highways - River and Harbor Developments - Bridges and Bridge Piers - Mine Shafts and Tunnels

ATLANTA	CARTAGENA	LONDON	MADRID
PITTSBURGH	LIMA	PARIS	ATHENS
CHICAGO	LA PAZ	BRUSSELS	MONTREAL
SAN FRANCISCO	BUENOS AIRES	ROME	TOKYO

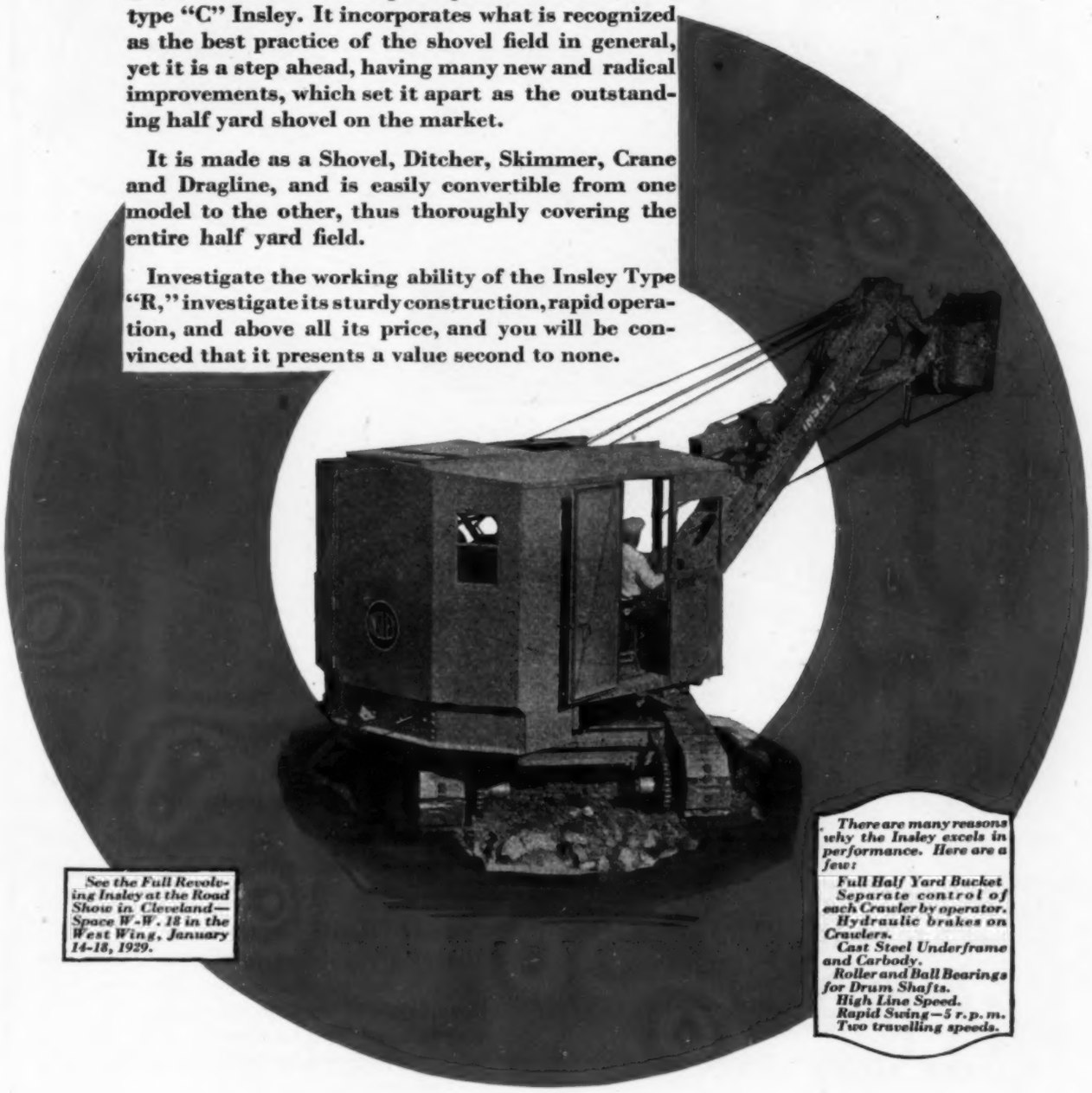
BUILDERS OF SUPERSTRUCTURES AS WELL AS SUBSTRUCTURES

THE FULL REVOLVING INSLEY

NOW there is a full revolving Insley. It is built on the tried and tested principles of the half circle type "C" Insley. It incorporates what is recognized as the best practice of the shovel field in general, yet it is a step ahead, having many new and radical improvements, which set it apart as the outstanding half yard shovel on the market.

It is made as a Shovel, Ditcher, Skimmer, Crane and Dragline, and is easily convertible from one model to the other, thus thoroughly covering the entire half yard field.

Investigate the working ability of the Insley Type "R," investigate its sturdy construction, rapid operation, and above all its price, and you will be convinced that it presents a value second to none.



See the Full Revolving Insley at the Road Show in Cleveland—Space W-W. 18 in the West Wing, January 14-18, 1929.

There are many reasons why the Insley excels in performance. Here are a few:

Full Half Yard Bucket
Separate control of each Crawler by operator.
Hydraulic brakes on Crawlers.
Cast Steel Underframe and Carbody.
Roller and Ball Bearings for Drum Shafts.
High Line Speed.
Rapid Swing—5 r.p.m.
Two travelling speeds.

700

INSLEY MANUFACTURING COMPANY - Indianapolis

Engineers and Manufacturers

THE ARC WELDING AGE

It's coming FAST

Prepare Now!

Automatically arc welding structural steel columns at Mississippi Valley Structural Steel Co.

All-welded greenhouse erected by E. W. McLellan Co.

Standard mill-type building completely arc welded by Youngstown Welding Co.

All-welded factory building erected by Mississippi Valley Structural Steel Company

America Bridge Co. crew arc welding roof trusses for huge G-E factory building

THE MORE YOU ARC WELD THE MORE YOU SAVE

The experimental stage is passed. Arc Welding is here to stay. To sit back and wait is to lose your position in the field.

Prepare now for the Age of Arc Welding in building construction. Begin studying designs, tests, welding equipment, and costs.

General Electric has unusually complete files of arc welding application and cost data. It manufactures the only complete line of arc welding equipment. And it offers you the most complete service available anywhere. Prepare now by using this service.

530-46

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

PAVERS

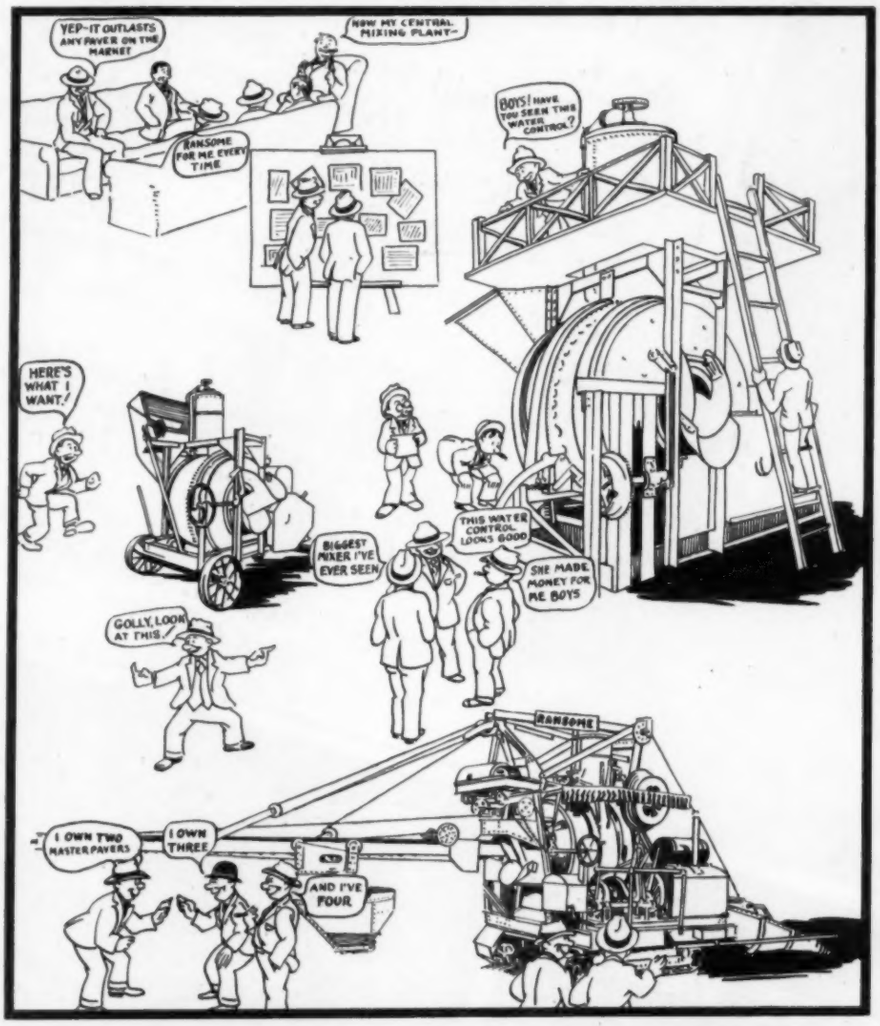
MIXERS

PNEUMATICS

The Ransome

Booth WW 103 at the ROAD SHOW~

CHUTES~


YEP-IT OUTLASTS ANY PAVER ON THE MARKET
NOW MY CENTRAL MIXING PLANT~
RANSOME FOR ME EVERY TIME
BOYS! HAVE YOU SEEN THIS WATER CONTROL?
HERE'S WHAT I WANT!
BIGGEST MIXER I'VE EVER SEEN
THIS WATER CONTROL LOOKS GOOD
SHE MADE MONEY FOR ME BOYS
GOLLY, LOOK AT THIS!
RANSOME
I OWN TWO MASTER PAVERS
I OWN THREE
AND I'VE FOUR

MIXERS

STEEL TOWERS

TILTING MIXERS

PAVERS

Ransome Concrete Machinery Company

Dunellen New Jersey

UNIVERSAL

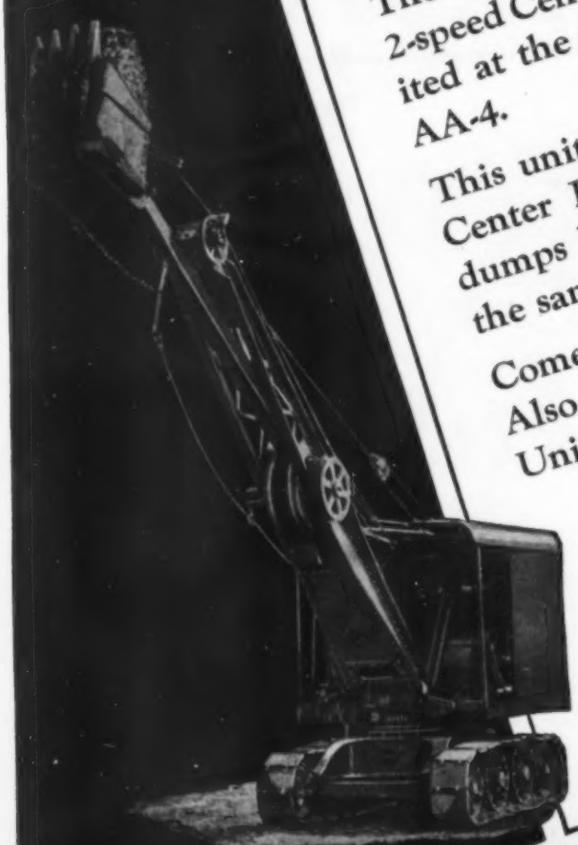
The new Universal-35, mounted on a Thew 2-speed Center Drive Crawler, will be exhibited at the Cleveland Road Show in Space AA-4.

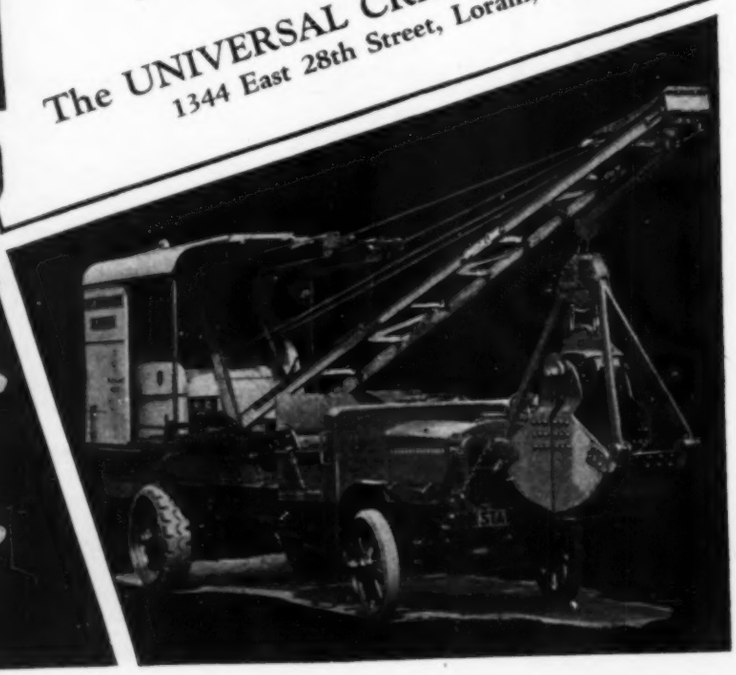
This unit will be equipped with a ½ yard Center Drive Shovel boom that digs and dumps higher than any other shovel with the same length of boom and dipper stick.

Come in and investigate this quality product. Also inspect its famous companion—The Universal Motor Truck Crane.

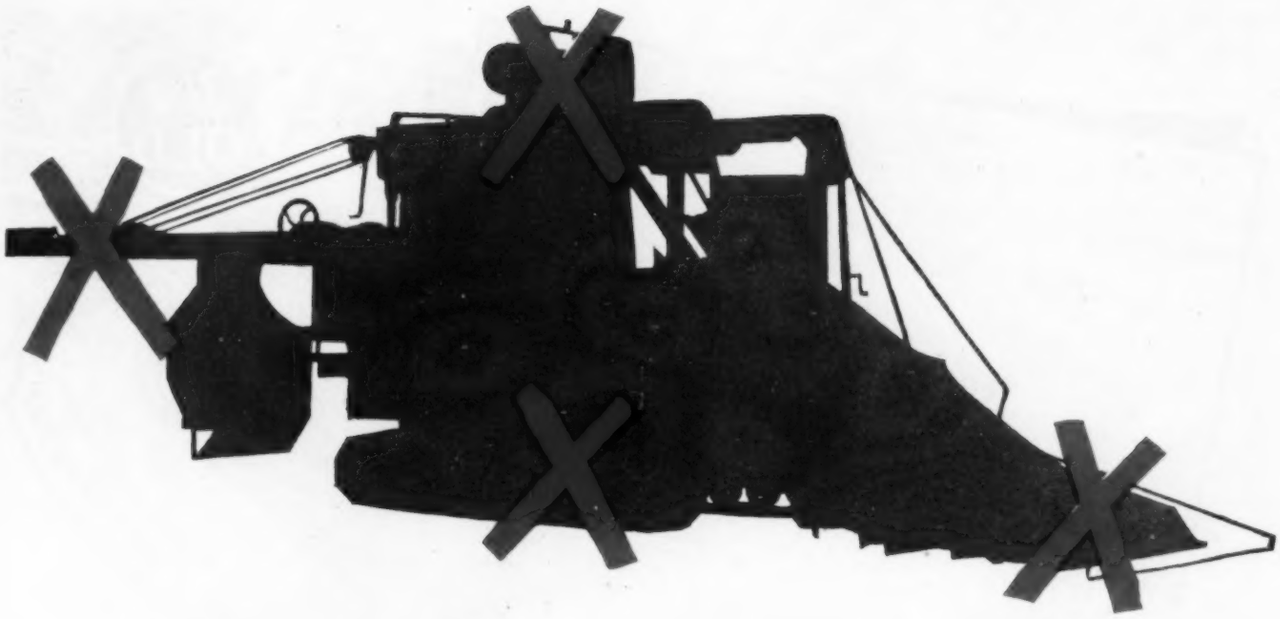
If you are not attending the Road Show, you'll at least be interested in "The Story of a ½-yard Machine." Just ask for Folder 214-H today.

The UNIVERSAL CRANE COMPANY
1344 East 28th Street, Lorain, Ohio



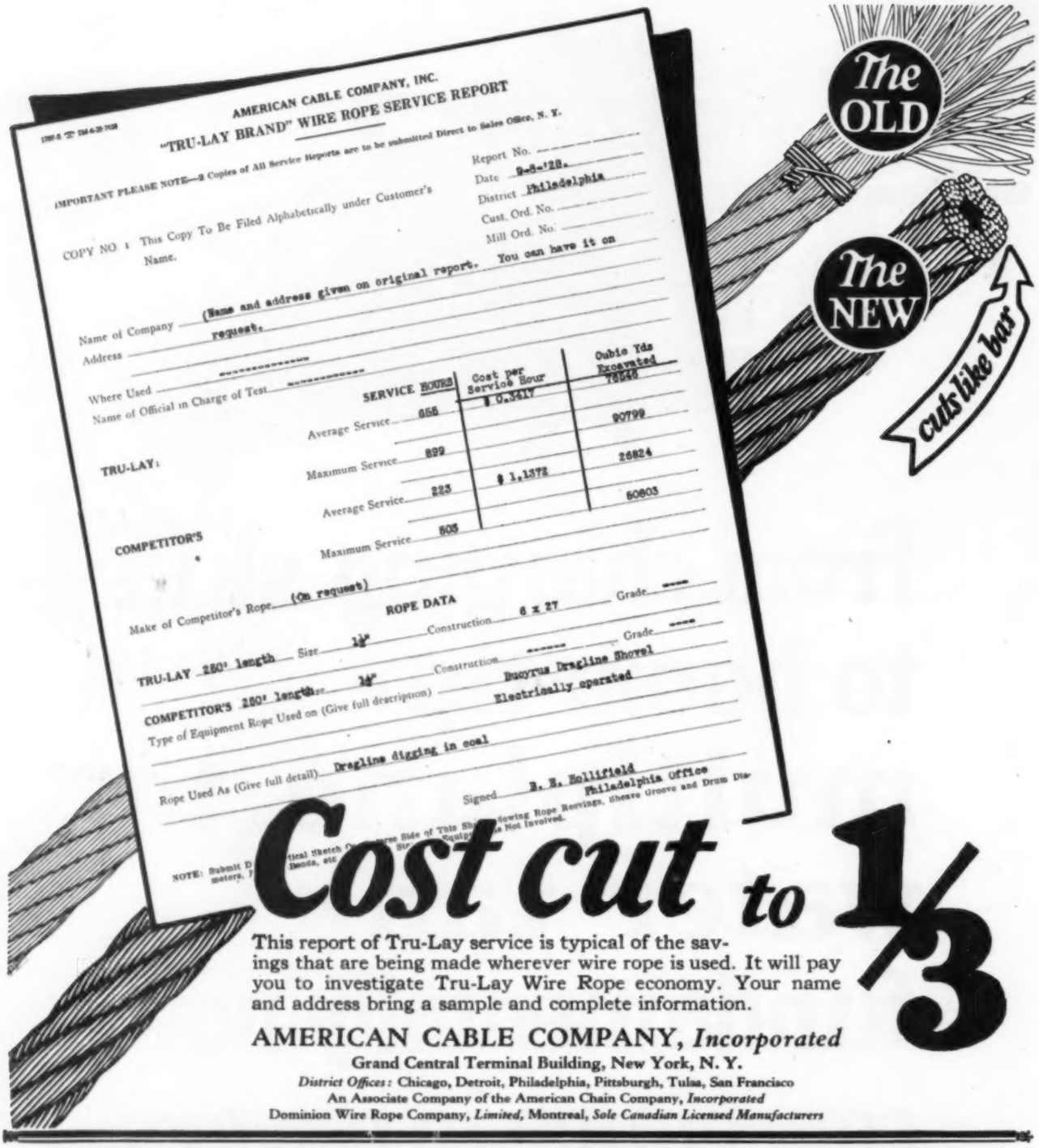


The GREATEST VALUES IN ½ YARD MACHINES



From charging skip to boom tip - multiplane to water tank - a fundamentally new conception in pavers - the Greater

KOEHRING


The OLD
The NEW
cuts like bar
AMERICAN CABLE COMPANY, INC.
"TRU-LAY BRAND" WIRE ROPE SERVICE REPORT
IMPORTANT PLEASE NOTE—2 Copies of All Service Reports are to be submitted Direct to Sales Office, N. Y.
COPY NO. 1 This Copy To Be Filed Alphabetically under Customer's Name.
Report No.
Date 2-8-'28.
District Philadelphia
Cust. Ord. No.
Mill Ord. No.
Name of Company (Name and address given on original report. You can have it on
Address request.
Where Used
Name of Official in Charge of Test
SERVICE HOURS
Cost per Service Hour
Cubic Yds Excavated
TRU-LAY:
Average Service 656 $ 0.3417 76548
Maximum Service 899 90799
COMPETITOR'S
Average Service 223 $ 1.1372 26824
Maximum Service 805 80803
Make of Competitor's Rope (On request)
ROPE DATA
TRU-LAY 250' length Size 1¼" Construction 6 x 27 Grade ----
COMPETITOR'S 250' length Size 1¼" Construction ------ Grade ----
Type of Equipment Rope Used on (Give full description) Bucyrus Dragline Shovel
Electrically operated
Rope Used As (Give full detail) Dragline digging in coal
Signed E. E. Hollifield
Philadelphia Office
NOTE: Submit D... tical Sketch ... rse Side of This Sh... owing Rope Rovings, Sheave Groove and Drum Dia... meters, ... Bends, etc. ... Equip... s Not Involved.

Cost cut to 1/3

This report of Tru-Lay service is typical of the savings that are being made wherever wire rope is used. It will pay you to investigate Tru-Lay Wire Rope economy. Your name and address bring a sample and complete information.

AMERICAN CABLE COMPANY, *Incorporated*

Grand Central Terminal Building, New York, N. Y.

District Offices: **Chicago, Detroit, Philadelphia, Pittsburgh, Tulsa, San Francisco**

An Associate Company of the American Chain Company, *Incorporated*

Dominion Wire Rope Company, *Limited*, Montreal, *Sole Canadian Licensed Manufacturers*

PREFORMED WIRE ROPE

TRADE **TRU-LAY** MARK

Reg. U. S. Pat. Off.

Detroit International Bridge

Philadelphia-Camden Bridge, The World's Greatest Suspension Bridge

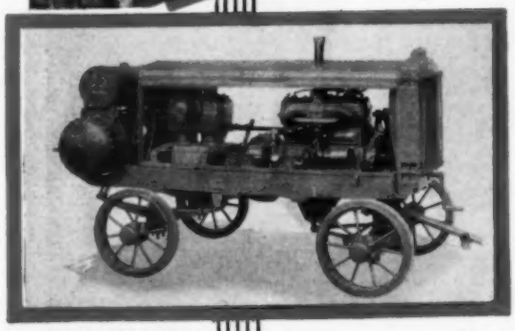
Mt. Hope Bridge, Bristol, R. I.

American Cable is used on the World's Greatest Bridges

Clear the Road!

See the new "Heavyweight CHAMP" (360 Cu. Ft.) at the Road Show

Get more work out of your tools by packing more air in them



120 Cu. Ft. Model Spring Trailer Type—Rubber-Tired Wheels

Meet us at the SHOW BOOTH WW72

The **Schramm Compressor** *is the answer*

YOU can't find a harder-hitting compressor than the Schramm. Nowhere will you find as great capacity per cu. ft. rating. The Schramm Compressor is made in more standard models than any other make. The largest, standard portable compressor made is a Schramm. This unit furnishes 360 cu. ft. of free air per minute and yet, because of the standard clutch feature, it can be started as easily as many units half its size.

All Schramm compressors have a heavy duty, self-aligning clutch to cut out the compressor when starting; an automatic cut-out to prevent motor racing; air cleaners on both engine and compressor; visible gasoline strainer; and standard A.S.M.E. riveted tanks.

Catalogs on Request.

Schramm Inc., Manufacturers
West Chester, Pa.
Offices and Representatives in Principal Cities

If *Results* Count, Here They Are!

One More Reason for Using *High-Early-Strength* Universal Concrete

Commercial Testing Laboratory Report

Note the *uniformly* high strengths obtained from test cylinders each of which was made from a different batch.

TELEPHONES ATLANTIC 0011-0012

WALTER H. FLOOD & CO.
CHEMICAL ENGINEERS
ROADS AND PAVEMENTS
933 EAST 44th STREET
CHICAGO

October 6, 1928.

J. A. Ross Construction Co.
228 N. LaSalle Street
Chicago, Illinois.

Gentlemen:

No doubt you will be pleased to see the cylinder compression tests from the bridge-approach pavement you constructed at Bryn Mawr Avenue and the Sanitary Canal, Chicago. The results follow:

Date Placed: October 1
Date Broken: October 5

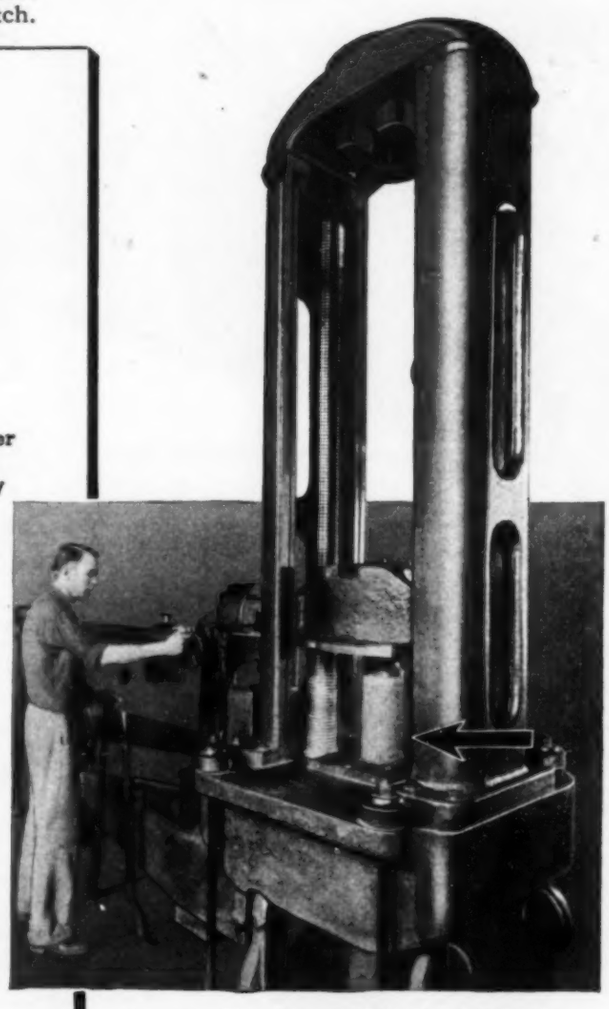
COMPRESSIVE STRENGTH. (Pounds per square inch)
Each cylinder made from a different batch.

Cylinder #1 - 2493
" #2 - 2581
" #3 - 2405
" #4 - 2390
" #5 - 2350
" #6 - 2390
" #7 - 2425
" #8 - 2440

These specimens show a well graded mixture and good compressive strength.

Respectfully submitted,

Walter H. Flood & Co.



Compressive Strength Testing Machine

Concrete as ordinarily mixed and placed reaches a compressive strength of about 2000 pounds per square inch in 28 days.

Tests on the above bridge approach show the *uniformly* high strengths that, with approved methods, can be obtained with the usual Universal cement in $^1/_7$ the time ordinarily required.

These *high-early-strength* methods will be sent on request. Send the coupon.

Please send me new booklet

Name

Address

Universal Portland Cement Co.
208 So. La Salle Street, Chicago

Without obligation, please send me new booklet giving full details for securing strong concrete in 3 days with the usual materials and labor.

CM 1-29

Universal Portland Cement Co.

SUBSIDIARY U. S. STEEL CORPORATION

Chicago Pittsburgh Minneapolis Duluth Cleveland Columbus New York

One Standard Cement for All Concretes and Mortars

Construction Methods

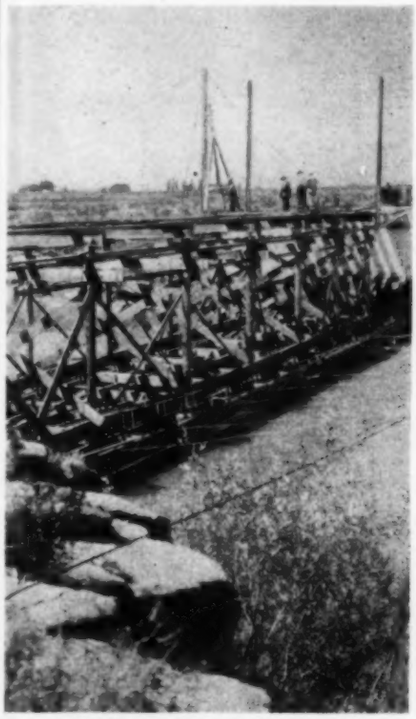
McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW, *Chairman of the Board*
MALCOLM MUIR, *President*
EDWARD J. MEHREN, *Vice-President*
H. C. PARMELEE, *Editorial Director*

A monthly pictorial of field practice and equipment illustrating successful construction, maintenance and material-handing methods for general construction, highways, buildings, industrial plants and public works and utilities

ROBERT K. TOMLIN, *Editor*

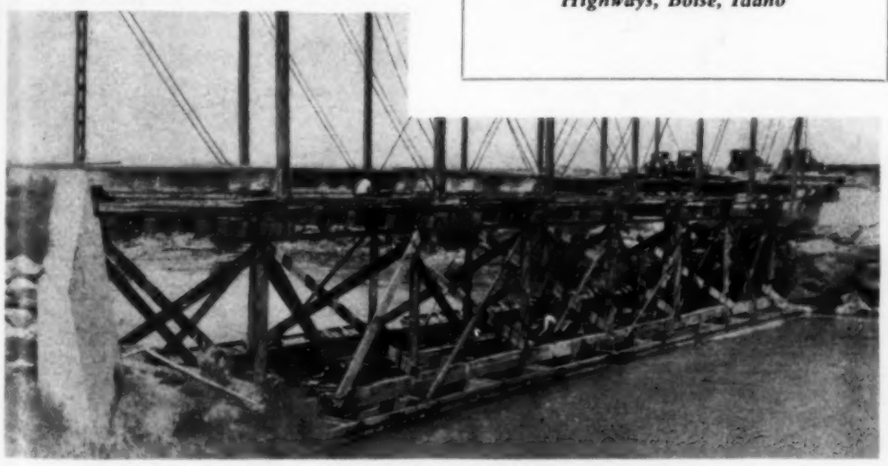
WILLARD CHEVALIER
Publishing Director

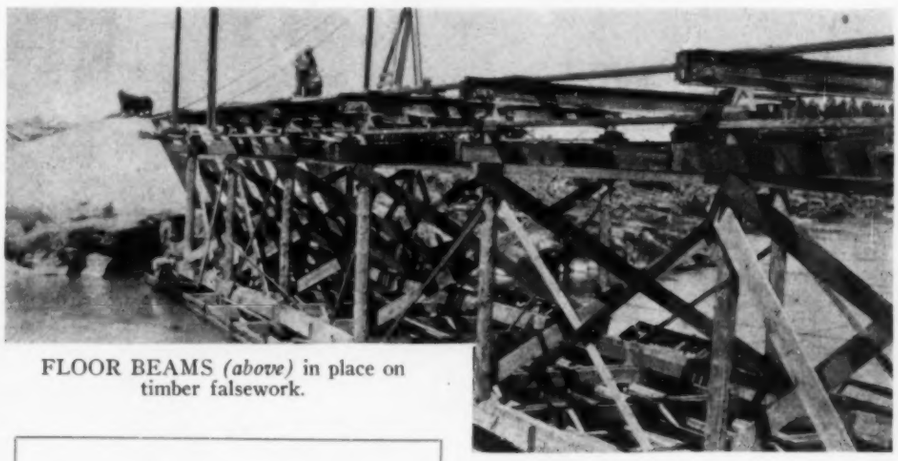
VOLUME 11 — NEW YORK, JANUARY, 1929 — NUMBER 1



SYSTEM OF CABLES *(above)* holds pontoons in place.

STEEL SPAN *(below)* on pontoon supports, nearly completed.





FLOOR BEAMS *(above)* in place on timber falsework.

The Problem

To erect a 140-ft. highway bridge span across Snake River, Idaho, at site where water is 80 ft. deep.

The Solution

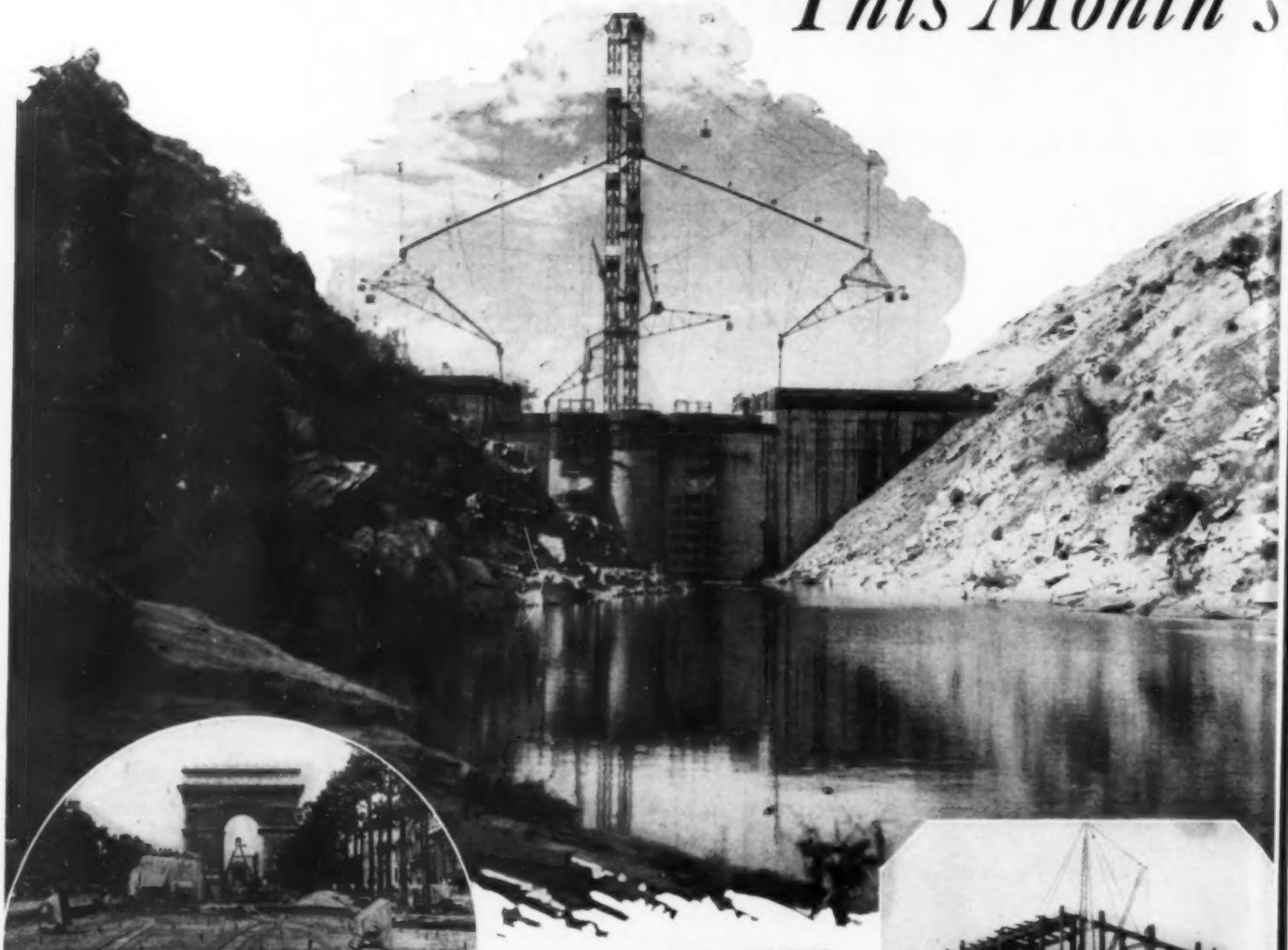
Pontoons used by B. H. Dinsmore & Co., of Ogden, Utah, to support falsework, as shown in photos from:

CHARLES A. KYLE
Bridge Engineer, Bureau of Highways, Boise, Idaho

FLOATING FALSEWORK *(below)* ready for carrying steel superstructure.

PONTOONS carry highway bridge falsework over river 80 feet deep

This Month's

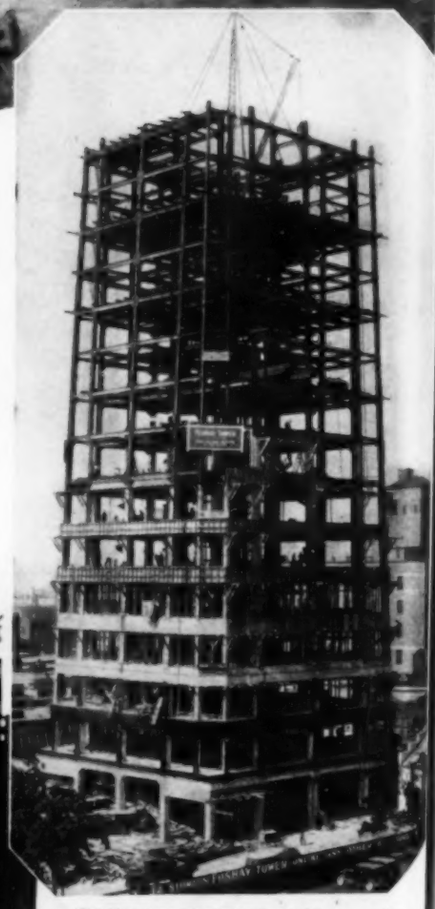


60,000 CU.YD. PER MONTH. That's the concreting pace the Atkinson Construction Co. is maintaining on the 360-ft. high Pardee Dam for the East Bay Municipal Utility District, Oakland, Calif.

© P&A

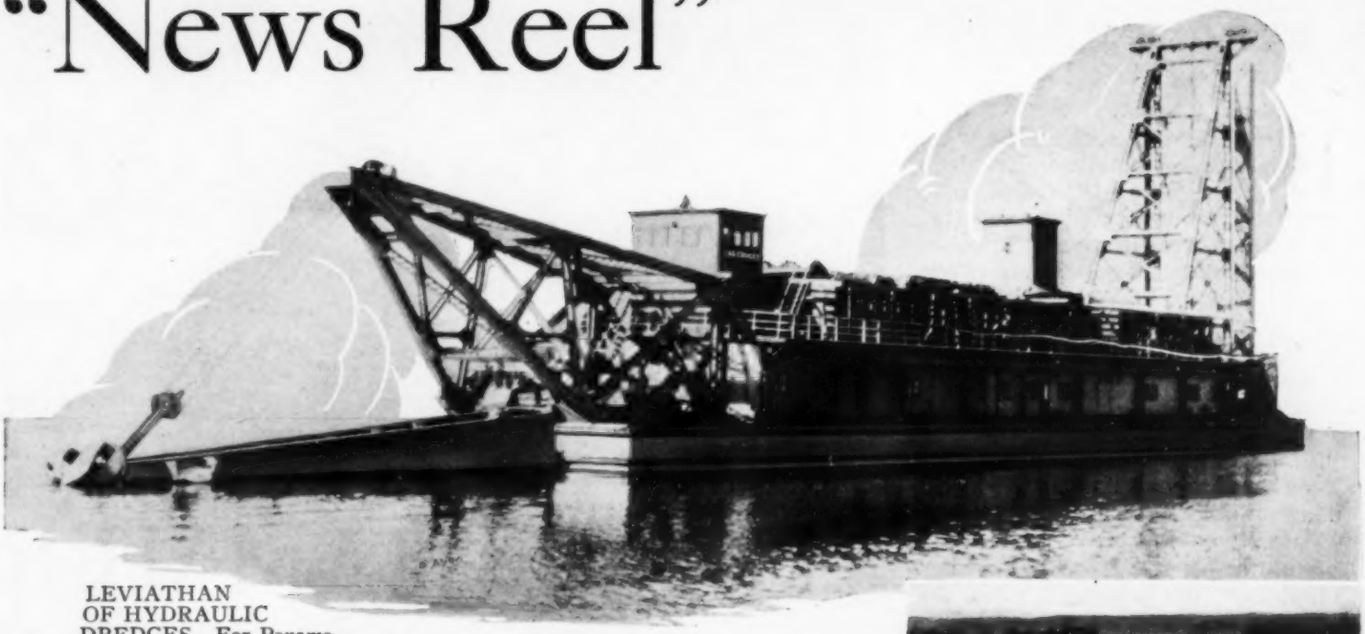
REPAVING *(above)* the Champs Elysées, famous Paris boulevard familiar to A.E.F. veterans.

NEW CHICAGO HOME for *Construction Methods* and other McGraw-Hill publications. Dilks Construction Co. starts work on McGraw-Hill Building on North Michigan Ave.



FOSHAY TOWER, Minneapolis, 32-story structure 450 ft. high, nearing completion by Oscar Daniels Co., of Chicago.

"News Reel"



LEVIATHAN OF HYDRAULIC DREDGES. For Panama Canal service Ellicott Machine Corp., of Baltimore, has designed and built 2,500-ton Diesel-electric dredge "Las Cruces," with 24-in. pump to handle 500 to 1,000 cu.yd. of material per hour through 2 miles of discharge pipe. A 200-ton agitating ladder, 90 ft. long, digs to 60-ft. depth. Dredge is powered by four Fulton-Diesel engines connected to Westinghouse generators. Pump motor is of 2,500 shaft horse-power.

STONY GORGE DAM, one of the recently completed structures of the U. S. Bureau of Reclamation for the Orland project in California.

© International

GIVING THE MOVIES A VOICE.—Building huge sound-proof stages for talking pictures at the Metro-Goldwyn-Mayer studios in Culver City, Calif.

© P&A

OPEN TO TRAFFIC. Great 5½-mile James River Bridge which Turner Construction Co. recently completed on Atlantic Coastal Highway in Virginia.

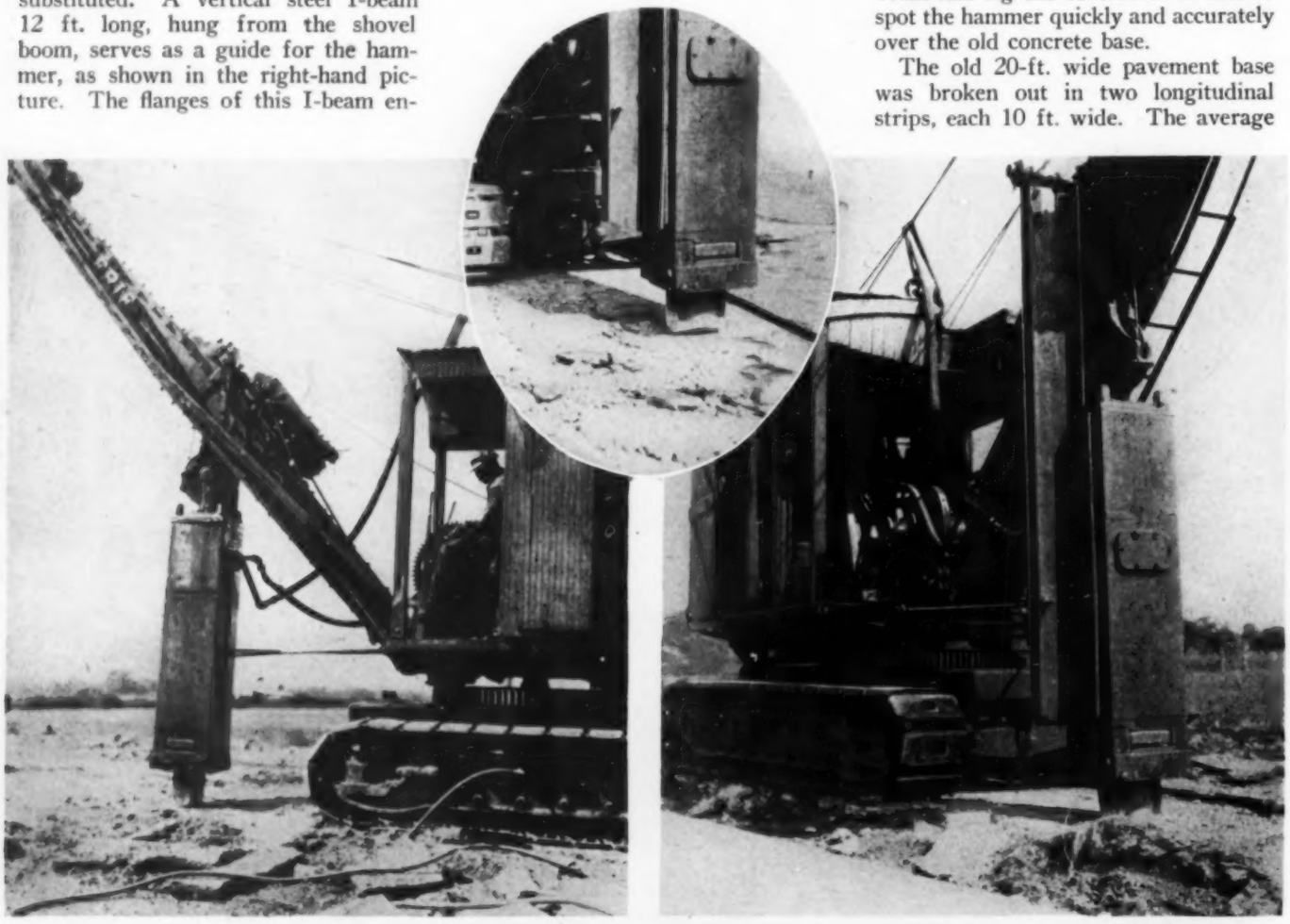
SKIMMER SCOOP (*right*) casts broken concrete of old base to side of road for use, later, on 10-ft. wide shoulders.

PILE HAMMER ROAD BASE

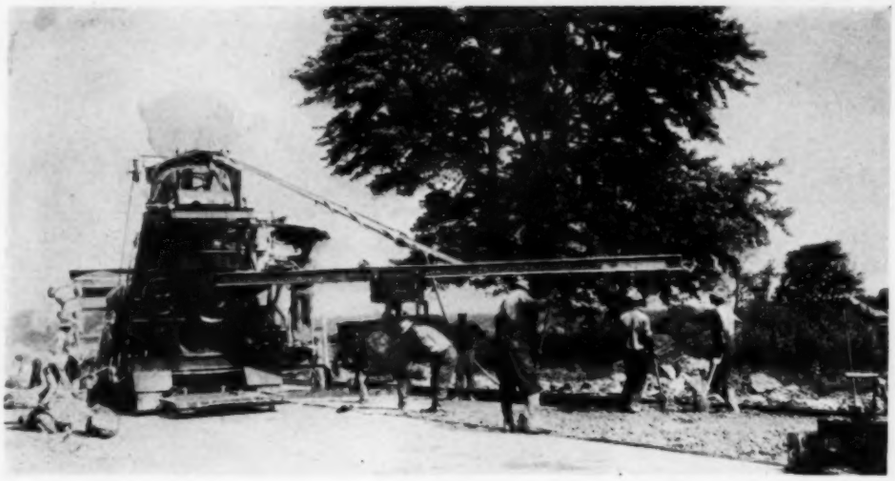
BEFORE the road-building organization of William Eisenberg & Sons, Inc., of Camden, N. J., could start reconstructing 5½ miles of the Trenton-New Brunswick route between Clarksville and Penns Neck, N. J., it had to break up and remove an old concrete base 6 to 12 in. thick, 20 ft. wide, and surfaced with a 2-in. asphalt top. The new pavement, of concrete, 29 ft. wide, was scheduled for construction in two 14½-ft. slabs 9 in. thick, thus leaving half the road available for traffic and material handling operations.

Pile Hammer Breaker—For breaking up the old base, Harry Eisenberg, member of the contracting firm, devised the special rig illustrated below. It consists of a 7,000-lb. McKiernan-Terry pile hammer suspended from the boom of a ¾-yd. crawler-mounted Erie steam shovel from which the dipper stick was removed. For the standard driving block of the pile hammer, a V-shaped chisel point of cast steel is substituted. A vertical steel I-beam 12 ft. long, hung from the shovel boom, serves as a guide for the hammer, as shown in the right-hand picture. The flanges of this I-beam engage and slide through a pair of steel guides on the side of the pile hammer. Steam for operating the hammer is delivered by the boiler of the shovel. With this rig the contractor is able to spot the hammer quickly and accurately over the old concrete base.

The old 20-ft. wide pavement base was broken out in two longitudinal strips, each 10 ft. wide. The average



PILE HAMMER PAVING BREAKER. Here is the special rig devised to demolish old concrete base. Pile hammer has special chisel point (*in oval, above*) and is hung from dismantled shovel boom (*left*). Vertical I-beam guide (*right*) controls hammer and prevents swinging. This rig breaks 900 to 1,000 lin.ft. of 10-ft. wide base daily.



CONCRETE PAVER, a 7-bag Ransome machine, rides on finished slab. Its reach is increased by 4-ft. boom extension.

BREAKS UP OLD 1 FT. THICK

performance of the pile hammer rig was from 900 to 1,000 lin.ft. of old concrete base 10 ft. wide broken out in a 10-hour day.

In the early stages of the work the pile hammer breaker was used directly on the top of the 2-in. asphalt surface over the old base. Later, however, the asphalt top was first stripped off with a skimmer scoop so as to allow the old concrete base to be finely crushed and used for the construction of 10-ft. wide shoulders specified for each side of the new concrete paving slab.

Behind the breaker a Keystone skimmer scoop, illustrated at the top of page 36, picks up the broken base and casts it to the side of the right-of-way, to be replaced later as shoulder material.

The breaking up of the old base and the concreting of the new pavement was done in half widths for the entire 5½-mile length of the contract so that one-half of the old pavement or one of the 14½-ft. slabs of the new pavement was always available for the transport of material.

Grading—With the old pavement broken out and removed, grading operations were carried on with Wehr power graders followed by a Buffalo-Springfield roller to compact the surface of the subgrade. Heltzel steel road forms were then accurately set to line and grade, fine grading was completed and the job was ready for concreting.

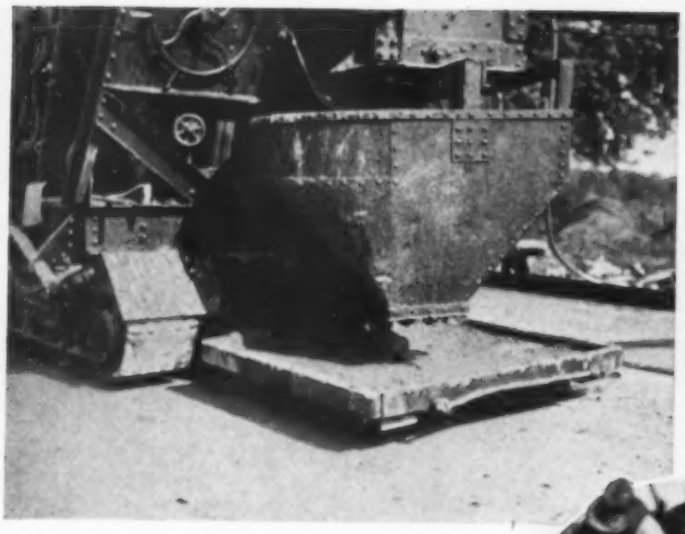
Concreting — Concrete aggregates were delivered by motor trucks covering a 12-mile haul to a central proportioning plant equipped with an Erie locomotive crane, ¾-yd. Blaw-Knox clamshell bucket, and a Blaw-Knox overhead bin and batcher plant. Motor trucks carried the measured batches to a 7-bag Ransome paving mixer which operated first from the unbroken half of the old road, and, later, from the half width of the finished concrete slab. When running on the completed slab, the paver was equipped with a drip pan under the discharge spout, as shown in the photograph at the top of page 38. This pan prevented concrete from slopping on to the finished paving surface and thus destroying its smoothness.

Another concreting detail was the use of lengths of No. 10 sheet steel bent to angle iron form and placed over the edge of the finished half width of pavement against which new concrete for the other slab was to be poured. These strips served three purposes: (1) They held the strips of premolded Carey longitudinal joint material flush against the slab side; (2) they pro-

HOOK at each end pulls out sheet steel joint holder, leaving joint strip in place. Note triangular cuts for dowel pin clearance.

JOINT HOLDER in place, with three dowel bars, ready for concreting. Sheet steel strip prevents flexible joint from buckling.

THE CONTRACTORS. Harry Eisenberg (*left*) and I. Eisenberg.



DRIP PAN under bucket and discharge chute protects finished slab on which paver rides.

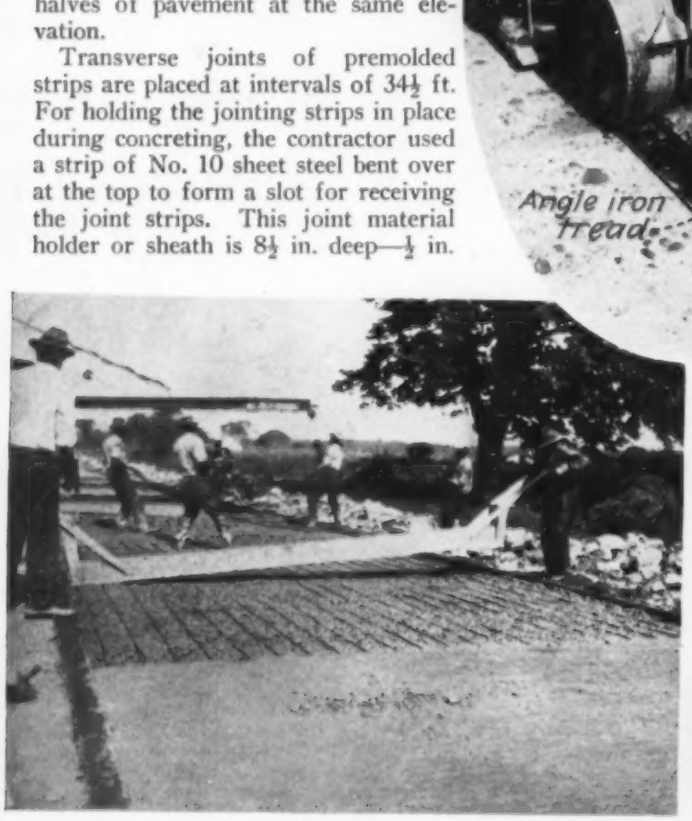
ANGLE IRON TREADS hold joint strip against finished slab and serve as smooth track (*in oval*) for finishing machine.

vided a smooth track for the wheels of the finishing machine and protected the finished slab edge from chipping; (3) they compensated for a ⅛-in. slump or settlement of the newly paved slab, thus leaving the surfaces of the two halves of pavement at the same elevation.

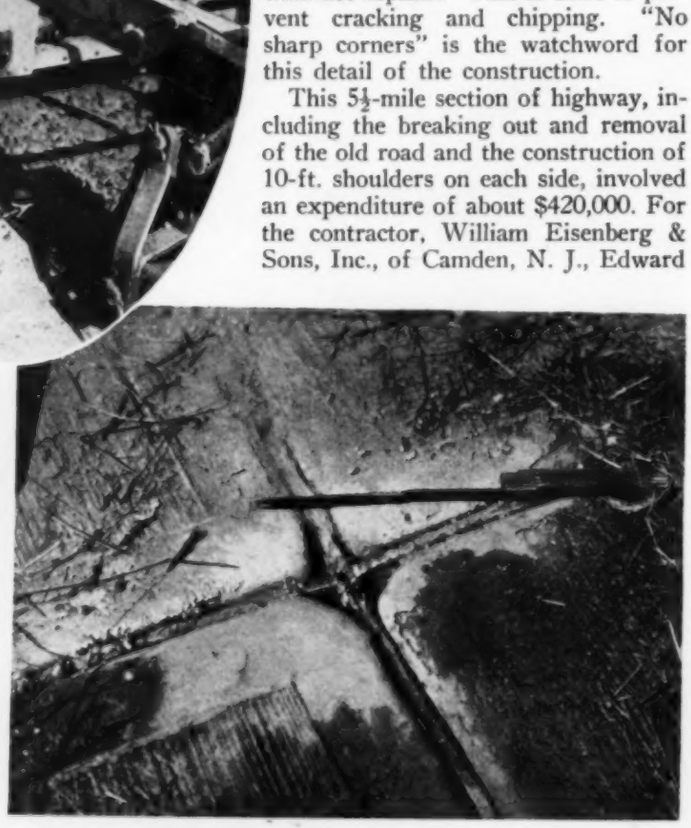
Transverse joints of premolded strips are placed at intervals of 34½ ft. For holding the jointing strips in place during concreting, the contractor used a strip of No. 10 sheet steel bent over at the top to form a slot for receiving the joint strips. This joint material holder or sheath is 8½ in. deep—½ in. less than the 9-in. thickness of the paving slab—so that the Lakewood finishing machine, following behind the mixer, did not foul the joint during its passage over the green concrete. At each end of the sheet steel holder are three triangular cuts to provide clearance for dowel rods, as shown in the two photographs on page 37. This holder or sheath maintains the jointing strip in place during concreting and is then easily pulled out by two men who insert hooks under the ends and raise the sheet vertically, as illustrated.

Where the corners of four slabs meet, great importance is attached to rounding and digging out the edges of the concrete with a trowel, as shown in one of the photos, and filling the joint with hot asphalt. This is done to prevent cracking and chipping. "No sharp corners" is the watchword for this detail of the construction.

This 5½-mile section of highway, including the breaking out and removal of the old road and the construction of 10-ft. shoulders on each side, involved an expenditure of about $420,000. For the contractor, William Eisenberg & Sons, Inc., of Camden, N. J., Edward Breslow was superintendent. Operations were carried on under the direction of the New Jersey State Highway Department, W. G. Sloan, chief engineer; Harry Robbins, division engineer; and Albert Elly, resident engineer.



STRIKE BOARD, with handles, pounds the mats of reinforcing steel into place in the green concrete.



NO SHARP CORNERS. Rounding edges, digging out with trowel and filling with asphalt prevents chipping.

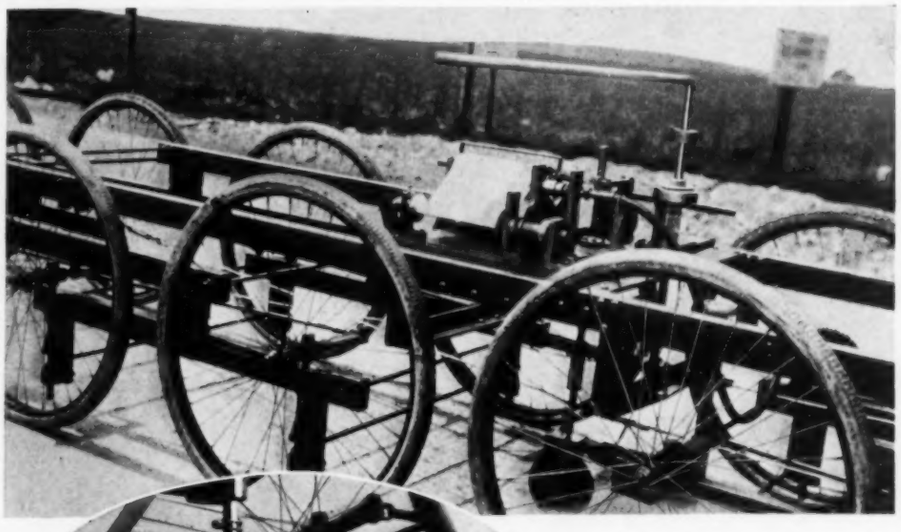
SURFACE TESTING MACHINES

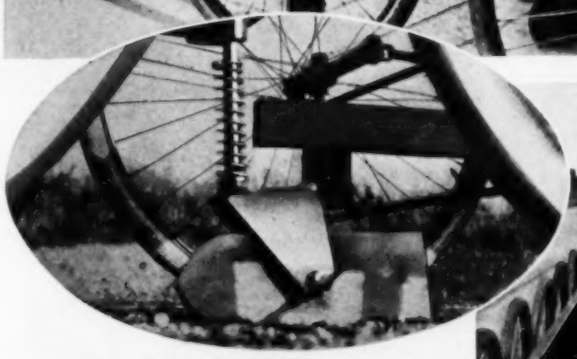
for Highways in Ohio

TWO machines for determining the smoothness of hard surface roads have been developed to an unusual degree of efficiency by the Ohio State Department of Highways. They are the surface tester, which takes the place of a straight-edge in detecting surface irregularities on a new road, and the profilometer, which records on a graph the profile of completed pavement for the purpose of determining whether the surface is as smooth as specifications require.

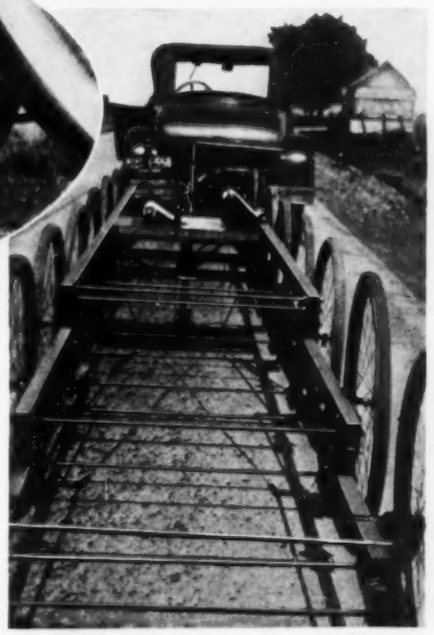
The profilometer consists of four trucks of four wheels each so arranged with pivoted connections that the indicating platform located on the neutral axis constantly maintains an elevation that is the average of the roadway over which the wheels pass. An indicating wheel or shoe is suspended from the platform and records variations in the surface on a roll of continuous paper by means of a stylus to which it is geared. The paper passes under the stylus and through a roller powered from one of the wheels of the profilometer. It it rewound on a spindle. Both sides of the paper are used.

In recording the surface variations of concrete, brick, and sheet asphalt, the gear ratio between the indicating wheel and the stylus is 3 to 1. On macadam, the ratio between shoe and recording arm is 2 to 1.

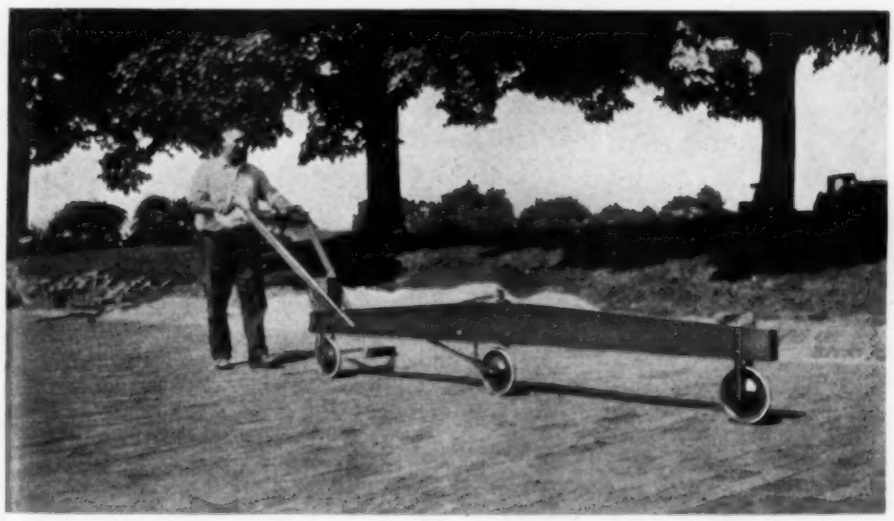




THE PROFILOMETER is a machine for recording the surface profile of a completed pavement. An indicating arm is geared to a stylus which is actuated in accordance with the vertical movements of the wheel or shoe on the indicating rod in contact with the pavement. The stylus traces the profile of the roadway on a continuous sheet of paper unrolled beneath it. Power for the roller is derived from one of the wheels of the profilometer. A METAL SHOE *(in oval)* is the contact instrument on macadam. For concrete, brick, and sheet asphalt, a wheel *(above)* is used.



FOUR TRUCKS of four wheels each are so arranged with pivoted connections that the indicating platform, which carries the stylus and roll, maintains an elevation that is the average of the roadway over which the profilometer passes.



SURFACE TESTER uses a suspended middle wheel as the indicating implement in checking the surface of a new pavement. An electrical circuit is completed, and a buzzer is caused to ring when variations of certain magnitude are encountered.

The surface tester indicates depressions as well as high spots in the surface of the roadway by means of a middle wheel free to move vertically. An electrical circuit which includes batteries and a buzzer is connected to a vertical arm attached to this wheel. When the wheel rises or falls a distance greater than is allowed for irregularities in a 10-ft. stretch, the arm is brought in contact with a brass "C" bolt, and the circuit is completed, causing the buzzer to ring.

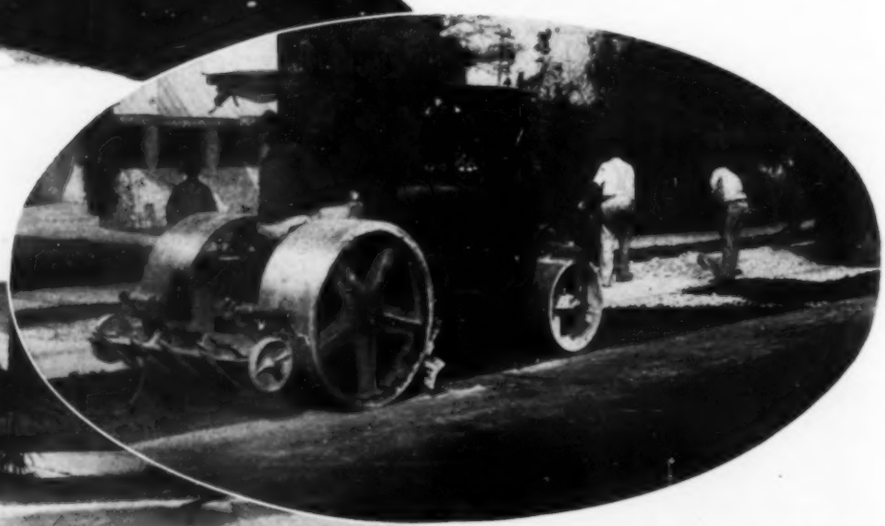
I

Asphalt Cold Patch

Step-by-Step

1 COLD PATCH material which is cheap and convenient has been developed by the city of West Palm Beach, Fla. Three men and a 1-bag concrete mixer can produce about 15 cu.yd. a day at a total cost of approximately $5 a cubic yard. When mixed at one of the city's asphalt plants the material is stored in the open until needed. In patching oiled streets a hole is cut in the pavement to a depth of 1½ in. and the material is spread in the depression.

2 RAKING the material to level it and to break up the lumps. The coarse appearance of the mixture is the result of the aggregates used.



3 COMPACTING the material with a 5-ton roller. After rolling, the cold patch material presents a uniform, homogeneous appearance. The mix consists of 6 parts rock passing a ¾-in. round screen and retained on a ¼-in. round, 3 parts sand, and 1 part Texaco liquid asphalt, containing 86 to 90 per cent bitumen. The oil is heated for mixing. All classes of bituminous pavement, including sheet asphalt and oiled streets, are patched with the material.

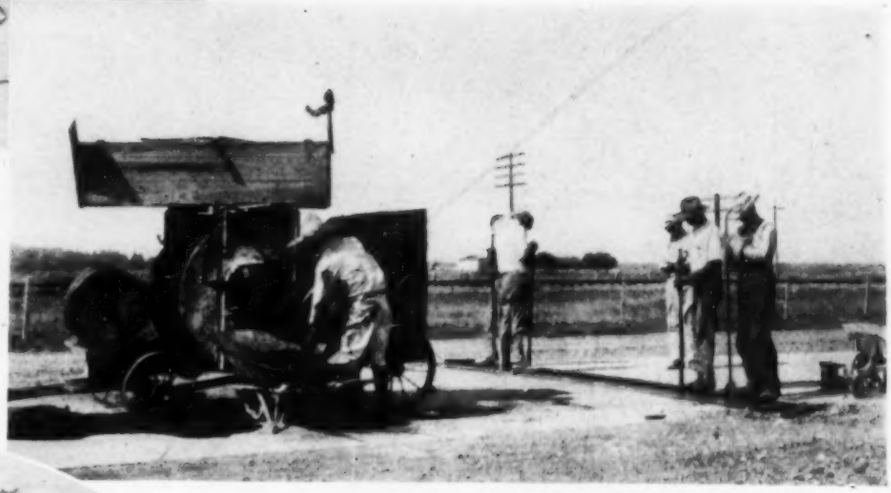
4 SAND is scattered over the surface of the patch to prevent the material from being picked up by vehicles. D. D. Howard, street superintendent, states that the patch is waterproof, with a close texture, and that the surface becomes smooth under traffic.

Field Methods

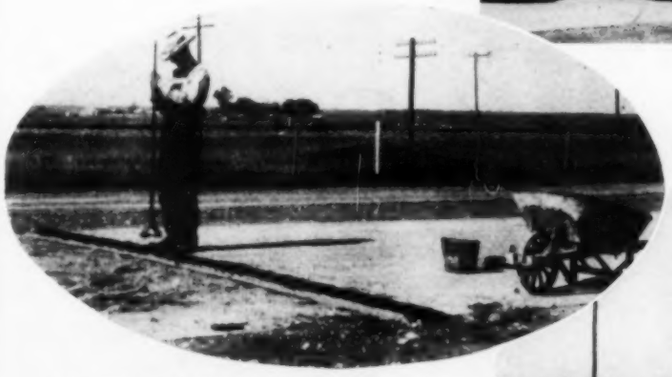
II

Widening Joints in Buckling Slab

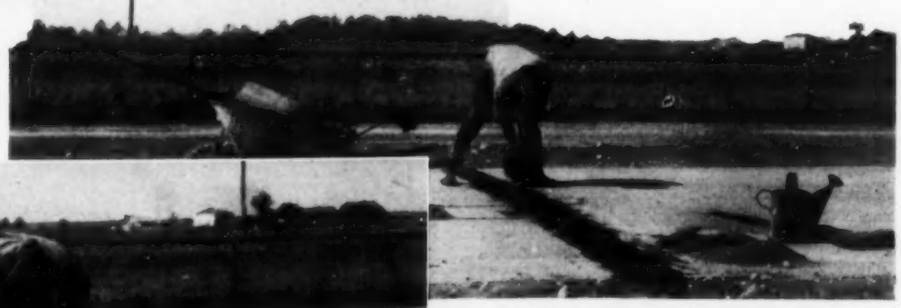
1 WIDER JOINTS were prescribed to remedy buckling in new concrete road in the Southwest, caused, perhaps, by both of adjoining slabs becoming bonded to dowel rods. Every 300 ft. or less, a ½-in. joint was widened to 4 in. with pneumatic tools. Dowel rods were cut with an acetylene torch.



2 ASPHALTIC CONCRETE filler was mixed in a Universal 1-bag mixer, placed in the 4-in. opening, and tamped. The mixer performed efficiently in producing asphaltic concrete. It was cleaned easily every morning by burning a quart of gasoline in the drum.



3 THE CROWN of the joint was placed and tamped by a workman who followed the regular crew.



4 SEALING of the filler was performed by another workman. He first scattered stone dust on the crown.

5 A HOT IRON sealed the surface of the asphaltic concrete and made the joint waterproof. Increasing the allowance for expansion by widening the joints and cutting out a 4-in. section of the dowel rods proved an effective cure for buckling in the slab.

TRANS-CANYON SPAN is three-hinged steel arch 616 ft. long, carrying 18-ft. concrete roadway 500 ft. above waters of Colorado River.

New Traffic Link

Spans the Grand Canyon

THE recent closing of the two halves of the 616-ft. steel arch span bridging the Grand Canyon of the Colorado River at Lee's Ferry, Arizona, at a height of about 500 ft. above water level, marks the completion, by the Arizona Highway Department, of the only vehicular traffic route across the great gorge in a length of 600 miles and opens up an immense northern area of the state rich in timber and mineral resources but hitherto difficult of access.

As designed by R. A. Hoffman, bridge engineer of the state highway department under W. C. Lefebvre, state highway engineer, the structure is a three-hinged arch designed for reversal of stresses to permit of erection as a cantilever. The total length is 834 ft., made up of twenty-two 28-ft. panels comprising the 616-ft. main arch span, two 84-ft. approach deck trusses on the north rim of the canyon and one 50-ft. approach truss on the south rim. The bridge carries a concrete paved roadway, 18 ft. wide between curbs. The rise of the arch is 90 ft., the height from shoe pin to deck, 103 ft., and the overall depth of the bridge 115 ft.

TOGGLE JOINT, in top chord, aided accurate closure of bridge halves.

Haulage of Materials — One of the difficult conditions that faced the Kansas City Structural Steel Co., which fabricated and erected the trans-canyon structure, was the necessity of getting 1,200 tons of steel to the site by motor truck over a 130-mile haul from Flagstaff, the nearest railway delivery point. The haulage job was sublet to E. M. Moores & Son, of Clarkdale, Ariz., who used two Fageol trucks, one a six-wheel, 10-ton capacity unit, with drive on the four rear wheels, and the other a four-wheel 3½-ton capacity truck, all mounted on pneumatic tires with duals on all rear wheels. Two-wheel dolly trailers completed the haulage equipment. The 130-mile trip by truck, through sand washes, over steep grades and uneven roads, required from 13 to 20 hours. To meet the limitations of transport by motor truck steel members for the bridge were fabricated and shipped in lengths not exceeding 53 ft. and weights of 12 tons or less. However, as much as 18 to 20 tons were hauled

in one load on the six-wheel truck and trailer.

On account of the 130-mile haul the amount of steel had to be kept to a minimum and provision was made for utilizing in the completed arch structure the ordinarily wasted materials in the tie-back details. Thus the approach spans were planned as pin-connected deck spans and the anchorage or tie-back eye-bars were designed so as to be used for the tension chords and diagonals of those spans.

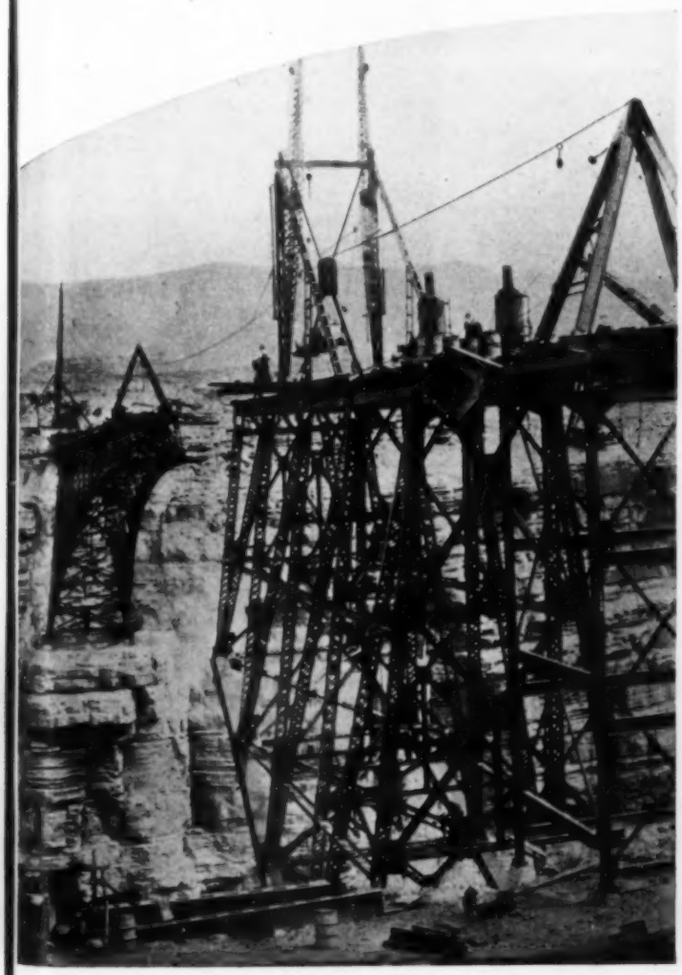
After excavation for approaches and anchorages at each end of the bridge had been completed and the arch pedestals concreted, huge steel shoes with 15-in. diameter pins were set on the south (Flagstaff) side. Then the first two panels of the arch, toggle joints and ties to the anchorage were placed and riveted. They were adjusted for line and grade by jack screws in the base of the shoe and then grouted.

The construction plan provided for erecting first from the south edge of the canyon the twenty-two panels comprising one-half of the bridge. Then, on the end of this completed 308-ft. cantilever, a 20-ft. tower was erected and a cableway carried to the north rim of the canyon for transferring steel and equipment to that side. After access to the north side had been established by the cableway the erection of the remaining cantilevered half of the bridge was completed.

STARTING ACROSS. Seven panels erected for south half of great cantilever span.

Toggles Aid Closure—An important element in the erection process was the use, in the top chord members of the trusses at each end, of large toggle joints, manipulated by screws, for lowering the two halves of the span to make possible the pin-connection closure at the center. With these toggles an accurate closure of the two halves of the arch was effected Sept. 12. The south half of the span was first lowered 9 in. before the toggles on the north side were operated to lower that end. The closure was begun at 11 a.m. and completed at 5:30 p.m. with both halves of the bridge bearing on their pins.

The 6-in. diameter screws (with $\frac{1}{4}$-in. pitch) operated the toggles through 5-ft. sheaves at their tops. The sheaves carried four or five turns of $\frac{5}{8}$-in. cable running to hoisting engine drums through sets of rope blocks. The toggle bars, as illustrated, were



A 30-TON TRAVELLER handled the steel erection, imposing a load of 15 tons on each truss. Note toggle joint in place in top-chord member.

BOTTOM CHORD is a box member built up of 8 angles and 3 plates. Maximum section is 32 in. square, with sectional area of 140 sq.in.

CONSTRUCTED AS CANTILEVER. First half of bridge span was extended 308 ft. from south rim of gorge. Then cableway was carried from its end to north side and transported material and equipment for erection of second half.

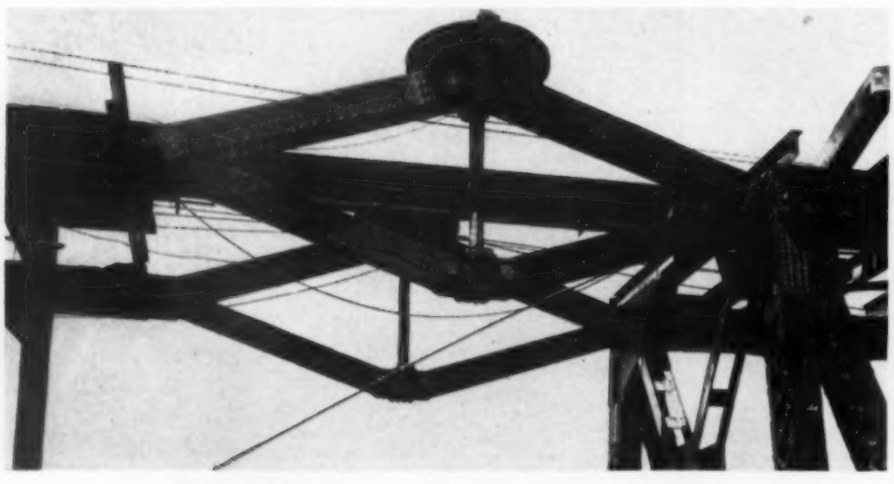
arranged in the form of a parallelogram with the 6-in. operating screw as the vertical or short diagonal, the end points being connected to the top chord of the arch span.

At the start of steel erection for the bridge, which was at the height of a metropolitan skyscraper above the rushing waters of the Colorado River, a problem in psychology was encountered. A rope net was designed and carried to the job, to be strung up under the bridge as a measure of safety while construction proceeded. The steel workers, however, would not allow it to be used. They contended that the mental hazard of the safety net would increase rather than decrease accidents. During the erection of steel one worker lost his life by slipping from a beam and falling 500 ft. to the bottom of the gorge.

A 130-MILE HAUL. All steel delivered by motor truck from Flagstaff.

COMING: Another pictorial article of exceptional interest to highway bridge engineers.

READ and SEE how the State Roads Commission of Maryland put an upper deck and roadway in the existing Havre de Grace bridge across the Susquehanna River. Both electric arc and gas welding played an important part in this reconstruction job by the Neeld Construction Company of Pittsburgh.



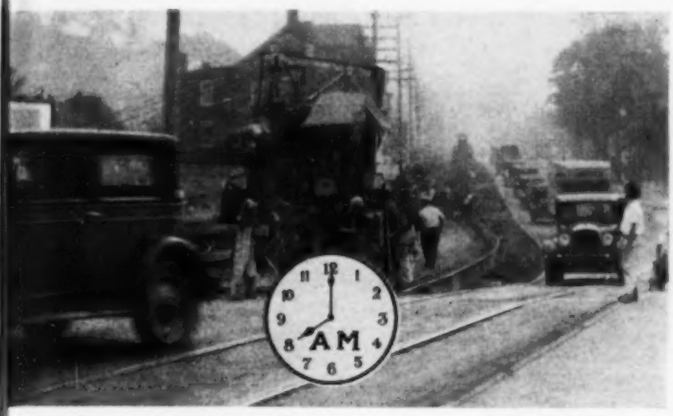
FOR CLOSING BRIDGE HALVES. Huge toggle joints operated by screws with sheaves at top carrying cable to hoist drums lowered cantilever spans for insertion of pins.

PIN CONNECTION being made at center of bridge as toggles lower ends accurately to place.

TRAFFIC *After 48 Hours*

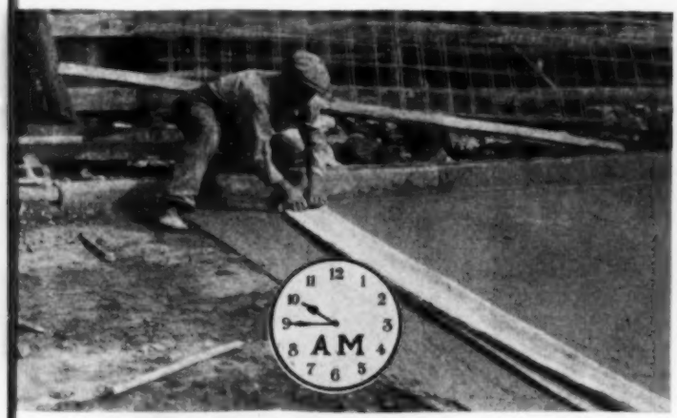
High-early-strength concrete solved the problem of quickly repaving Hanover Ave., a main thoroughfare of Allentown, Pa., which was reopened to traffic 48 hours after the last batch of the concrete was poured. Under the direction of E. M. Meckley, city engineer, George H. Hardner, local contractor, handled the construction in half-widths, using standard Lehigh portland cement, with an addition of 2 lb. of calcium chloride per bag, for his 1:2:3 concrete, which attained compressive strength of 2,250 lb. per sq.in. in 2 days.

1 SEPT. 7 (FRIDAY) 2 P.M. Work starts on preparation of Hanover Ave. approach to Hamilton St. Bridge.



2 SEPT. 8 (SATURDAY) 8 A.M. Mixer arrives on job to place concrete in half-widths; traffic on other half of street.

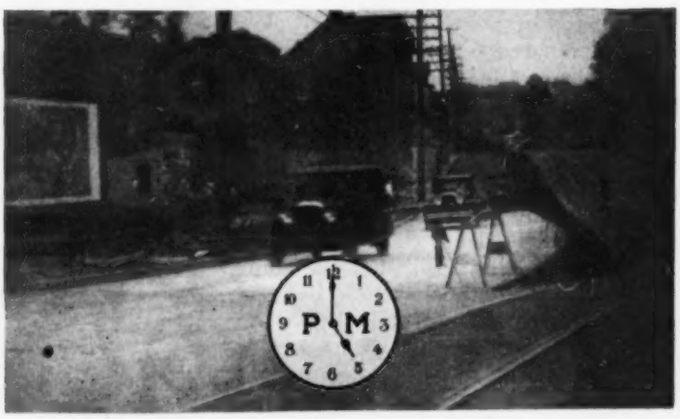
3 SEPT. 8, 9:15 A.M. First concrete is placed by Koehring paver; tests showed average slump of 3 in.



4 SEPT. 8, 9:45 A.M. Concrete pavement surface is being hand-finished with belt.

5 SEPT. 8, 11:45 A.M. Burlap strips are being placed to aid in curing the green concrete.

6 SEPT. 8, 4:55 P.M. Water is sprinkled on burlap covering to keep concrete moist.

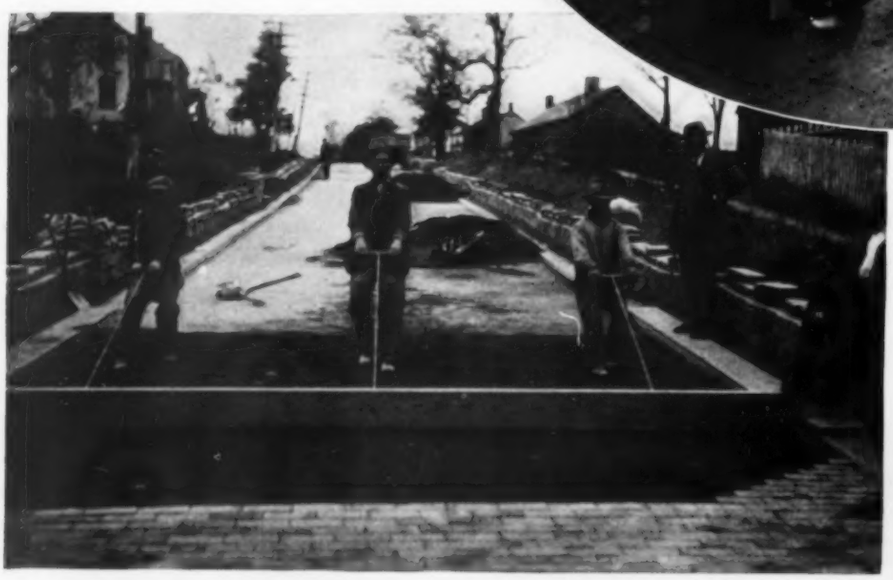


7 SEPT. 10 (MONDAY) 5 P.M. As evening approaches traffic uses new pavement 48 hours after last batch of concrete was poured at 5 p.m., Saturday, Sept. 8.

MODERN BRICK PAVEMENT

BRICK pavement of the most modern type is being built on two adjoining contract sections of the William Penn Highway west of Pittsburgh, Pa. Adequate design, careful inspection, and sound construction are combined in the effort to produce a pavement of long life and low maintenance cost. The design conforms with the general construction recommendations contained in the recent report of the Engineering Commission (William H. Connell, chairman) appointed by the National Paving Brick Manufacturers' Association, viz.: a subgrade stable under all weather conditions, an adequate foundation, a sand bedding course preferably ¾-in. thick, brick which definitely provide for proper spacing at the joints, and asphalt filler.

SAND AND CEMENT for the cushion are mixed by hand on the base.



SCREED *(above)* of planks used to spread cement-sand cushion to ¾-in. depth.

R. GALIARDI *(below, left)* and P. P. SANTINI, in charge of the work on Section 2.

On top of a well drained and carefully prepared subgrade is laid a concrete base 18 ft. wide of 8-6-8-in. (parabolic curve) cross-section. The top of the base has a 1-in. crown, with a 3¾x12-in. header curb along each edge. A cement-sand bedding course is spread to a depth of ¾ in., and wire-cut lug vitrified fire clay paving brick are laid on this cushion. The joints are filled with asphalt poured by hand, except on grades greater than 6 per cent, where grout filler is used. Asphalt is not allowed on steep grades because of the danger of its oozing over the surface, thus making the pavement slippery in wet weather.

The Pennsylvania Department of

THE BRICK are laid on a 1:4 cement-sand bedding course. Lugs on the brick insure proper spacing at the joints.

as Pennsylvania Builds It

BRICK SURFACE is carefully checked with a 10-ft. straight-edge.

DEFECTIVE BRICK *(above)* are replaced after inspection.

EARL H. NEWELL *(below)* directs operations on Section 1.

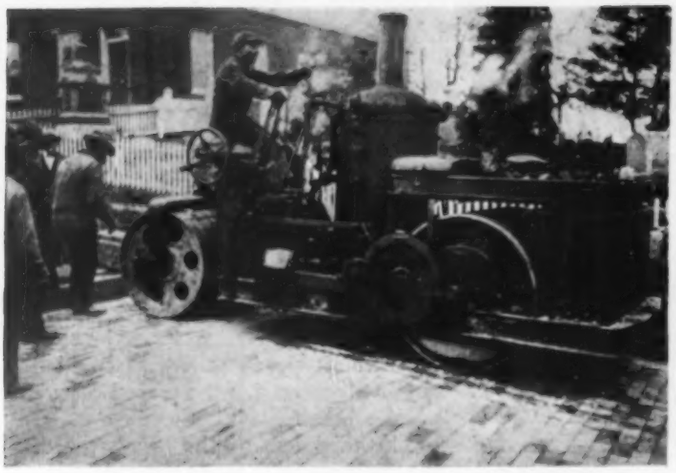
JOINTS are poured by hand with small cans. An ordinary coffee pot is the common container.

Highways has great confidence in the durability of brick pavement when properly constructed. Brick was selected as the wearing surface on the William Penn Highway sections because this type of pavement could be expected to last for the period covered by any bond.

The thickness of the brick was determined as the result of tests conducted in all parts of the country. These tests indicate that 3 in. is the economical depth for brick in a pavement of the type under construction. A brick course of less than 3-in. thickness is likely to buckle, especially with grout filler. A very thin brick also is subject to fracture under a hard blow, because it has not enough volume to absorb the shock.

Fire clay brick is being used because the State Department of Highways has been satisfied with demonstrations of the durability of this type of brick on county highways. Hardness and toughness are the principal characteristics desired in a paving brick. Brick made from fire clay can be vitrified at the high temperature necessary to gain hardness and toughness without any loss of these important qualities through the development of brittleness.

The top course of both contract sections is being constructed of Mack-Dunn wire cut lug vitrified fire clay paving brick, size $3\frac{1}{2}$x3x$8\frac{1}{2}$ in. The brick is manufactured at the New Cumberland, W. Va., plant of the Crescent Brick Company, about 10



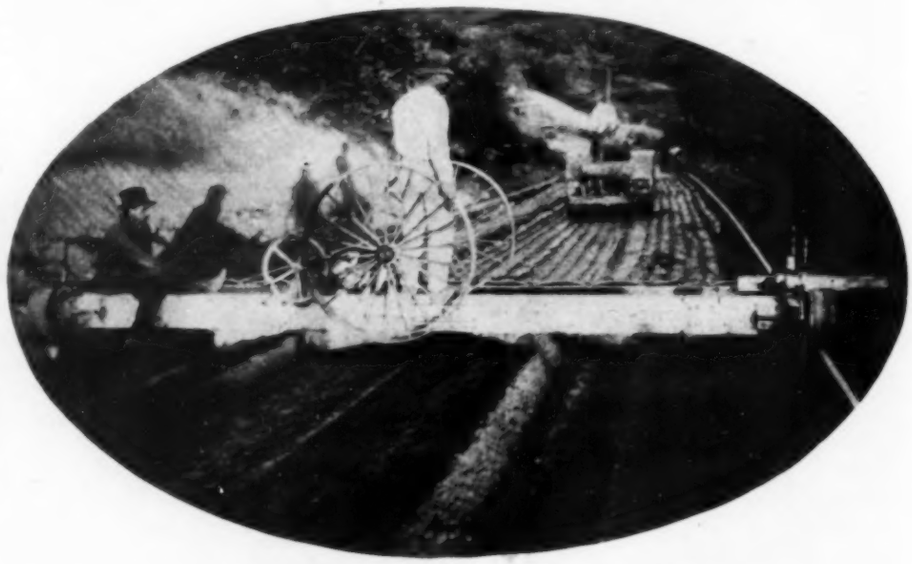
A 5-TON ROLLER starts rolling diagonally from the curb to the centerline.

TWO ASPHALT HEATERS are used with the pouring crew to avoid delay in heating filler.

miles from the Pennsylvania state line, where the construction on the William Penn Highway begins.

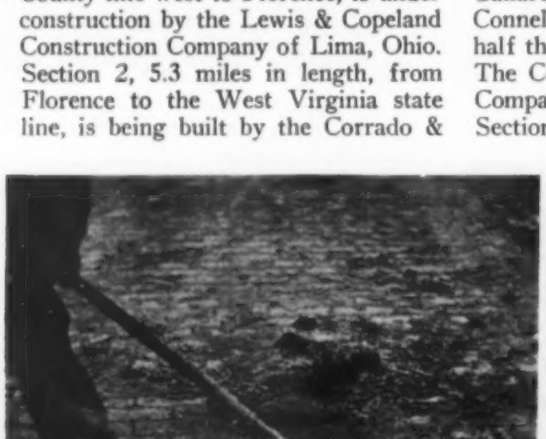
Filling Joints—A clause in the Pennsylvania specifications, covering the method of filling joints with bituminous material, reads: "The joints shall be filled by means of approved pouring cans. A slight excess should be poured into the joints, and the filler must not extend beyond the width of the joints." The primary object of this provision is to keep the brick surface bare of filler and thus prevent the pavement from becoming slippery in wet weather. It serves a secondary purpose in giving greater assurance that the joints are filled to the bottom of the brick, thus insuring a perfect seal in the top course.

The entire length of the William Penn Highway in Washington County is being paved with brick. Section 1, 7.95 miles long, from the Allegheny County line west to Florence, is under construction by the Lewis & Copeland Construction Company of Lima, Ohio. Section 2, 5.3 miles in length, from Florence to the West Virginia state line, is being built by the Corrado & Galiardi Construction Company of Connellsville, Pa. On Section 1, about half the base was constructed in 1928. The Corrado & Galiardi Construction Company completed all the base on Section 2, and in November started laying brick in the town of Florence.



SUBGRADERS were used by both construction organizations.

The $\frac{3}{4}$-in. bedding course is made with a 1:4 mixture of sand and cement, designed to fill the two requirements of elasticity and stability. Moisture present in the sand is sufficient to



EXCESS FILLER is scraped off the bricks before the surface is sanded.

ONE-MAN GRADER started the work of preparing the fine grade. It scarified and bladed.

THE FIRST MACHINE on the subgrade, after the forms were set, was a smaller one-man grader.

A SMALL ROLLER scarified the subgrade for shaping by the subgrader.

FILLS were built up in 8-in. layers of loose dirt, thoroughly compacted by heavy rollers.

cause the mix to set up and to prevent movement without destroying the cushion effect. R. Galiardi and P. P. Santini, in charge of the work for the Corrado & Galiardi Construction Company, use a screed made of planks to spread the cushion to proper depth.

Laying Brick—Uniformity in the size of the brick and the thickness of the lugs make it easy to keep the brick courses in good alignment. An occasional straightening with block and mallet is necessary. The brick are rolled with a 5-ton roller which starts at the curb and rolls diagonally to the centerline. It repeats the operation on the other side of the centerline and completes the rolling by covering the surface at a 45 degree angle in both directions.

The base is checked with a 10-ft. straight-edge, for the third time, just before the cushion is spread. Variations of more than $\frac{1}{4}$ in. are removed by grinding. After rolling, the brick are carefully inspected for defects and for surface variations. The 10-ft. straight-edge is used to detect surface irregularities. A variation of $\frac{1}{8}$ in. is permitted. Low bricks are pulled and raised, and high ones are either tamped to grade or pulled and lowered. All cracked and crooked bricks are culled. Bricks chipped on the surface or slightly damaged at one corner are turned over. When corner chips are serious, the bricks are discarded.

Up to 1928, hand pouring of joints had not been employed on a large scale in Pennsylvania, because the state was not constructing much brick pavement. It has been the method used on state work for several years, however, and the Corrado & Galiardi Construction Company undertook to fill the joints on its section by means of pouring cans. A crew of 36 men was employed on bedding course, brick, and joints. Maximum progress after five days was 225 ft. in one day. To complete the work in any reasonable length of time, a number of crews would have to be employed.

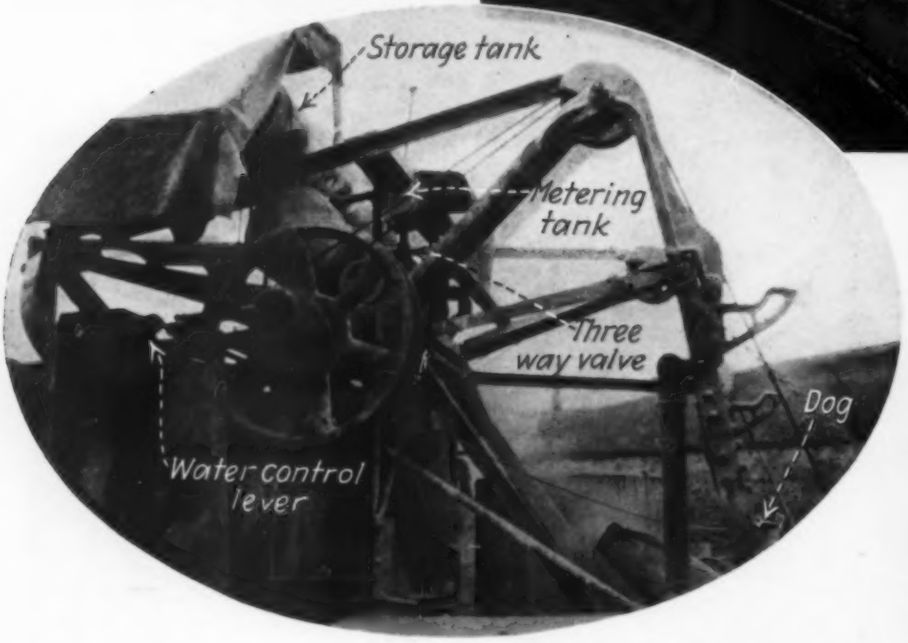
The pouring cans are small hand pots, which have to be replenished every few minutes from a 500-gal. asphalt heater. From 16 to 21 men are kept busy pouring joints. In placing an excess of asphalt on the joints, the filler spreads over the surface of the adjoining bricks. This excess is

TRACTORS and 5-yd. dump wagons hauled the spoil from the B. A. Jacobson shovels.

scraped off before the surface is sanded.

Machines and methods used on Section 1 by B. A. Jacobson, Inc., of Omaha, Neb., subcontractor for the rough grading, and by the Lewis & Copeland Construction Company are illustrated by the accompanying photographs. Calcium chloride admixture was the curing agent on both sections. Wet burlap was removed after 24 hours.

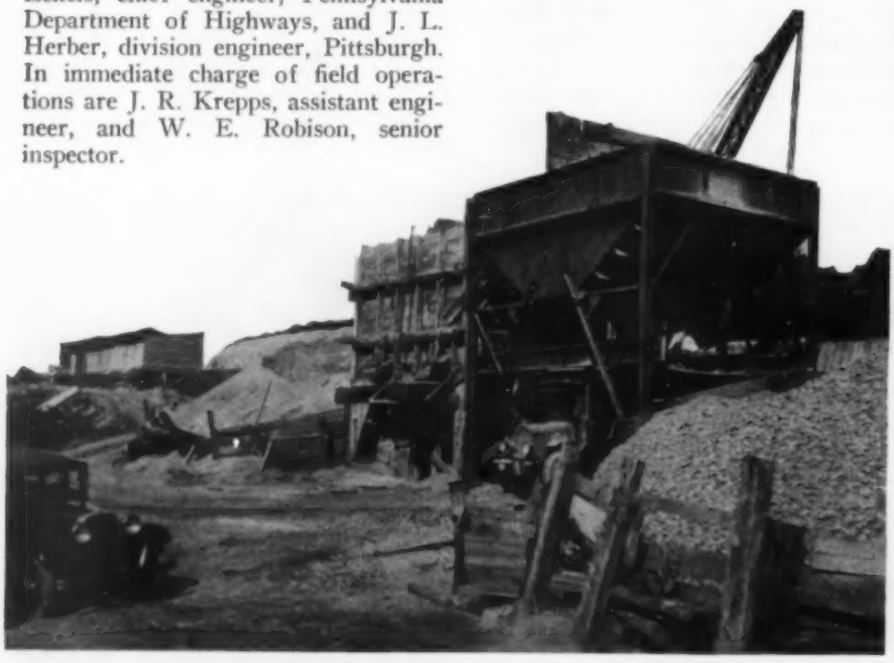
BASE CONCRETE on Section 2 was made with gravel aggregate. Slag was used in the curbs.



THREE-WAY VALVE controlled intake and discharge of metering tank for calcium chloride solution. Skip of mixer struck dog and opened valves from water and calcium chloride tanks.

CALCIUM CHLORIDE was mixed in a tank on the paver and the solution was pumped to a storage tank above.

The brick pavement is being constructed under the direction of Samuel Eckels, chief engineer, Pennsylvania Department of Highways, and J. L. Herber, division engineer, Pittsburgh. In immediate charge of field operations are J. R. Krepps, assistant engineer, and W. E. Robison, senior inspector.



BATCHING HOPPERS for sand and gravel were provided under the steel bins. Boxes on wood bins proportioned sand and slag for curb mix.

CURB FORM of sturdy construction included knee brace and anchor stake.

THE SMALL GRANITE CUBES are laid out in a fan-shaped design and bedded on a sand cushion.

Bridge Floor Paved With GRANITE BLOCK

AFTER Walter S. Rae, general contractor of Pittsburgh, Pa., had completed the main structure for the $2,000,000 reinforced concrete arch Memorial Bridge at Market St., Wilkes-Barre, he turned the roadway over to Purdy & Saunders of Winston-Salem, N. C., for paving. The type of surfacing selected was Durax, comprising small granite cubes laid in a fan-shaped design and jointed by brooming in portland cement grout. The advantages claimed for this type of pavement are durability and non-slipperiness. The blocks were shipped to the job by the H. E. Fletcher Co. of West Chelmsford, Mass. The photos illustrate the paving methods employed.

JOINTING MATERIAL is portland cement grout poured on pavement surface and thoroughly broomed in.

Cuba's New CENTRAL

HEAVY GRADING with power shovel and motor trucks in Province of Oriente.

PLACING CONCRETE BASE and concrete header curbing in Province of Pinar Del Rio.

INVOLVING an expenditure of more than $75,000,000 and a length of 701 miles, the contract for constructing the Central Highway of Cuba, extending from one end of the island to the other, is the largest of its kind ever awarded. Of the total mileage included in the contract Warren Brothers Company, of Boston, Mass., has 480 miles at a contract price of $53,270,000, while the remainder is being handled by the Associated Cuban Contractors, Inc.

The huge scale upon which the work is proceeding since the contract was signed Feb. 19, 1927, is indicated by the fact that the American contractor and his associated sub-contractors are employing 8,000 men, almost all Cuban citizens. Up to the beginning of this year about $25,000,000 worth of work had been completed on the Warren contract and it is expected that the entire job will be finished two years hence.

The design provides for a base of 1 : 2½ : 5 concrete, 6 in. thick at the center and 9 in. at each side, surfaced with a Warrenite-Bitulithic wearing course, retained at the sides by header curbs 2 in. deep. Outside of towns the width of the highway between header

BITUMINOUS WEARING SURFACE being applied to concrete base. Note 2-in. header curbs for side support of top course.

701-Mile HIGHWAY

PREPARING SUBGRADE of Telford base with waterbound macadam surface on existing routes.

COMPLETED PAVEMENT showing bituminous wearing surface between 2-in. header curbs.

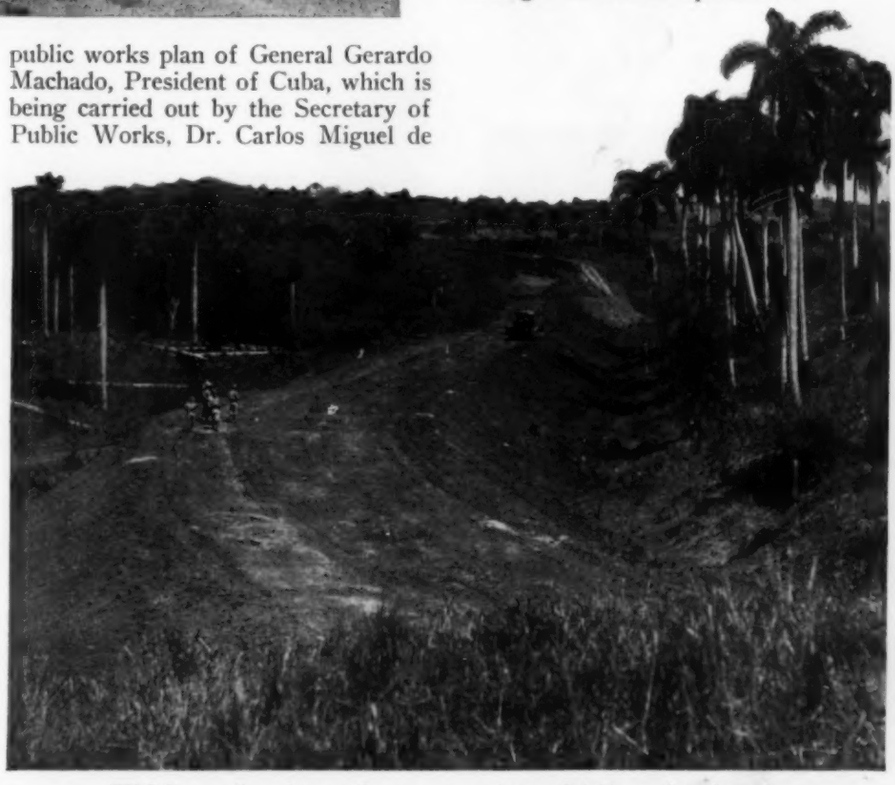
curbs is 6 meters or about 19½ ft. In the towns the width increases to 8 meters or about 26 ft. between curbs. There are no grades exceeding 5 per cent and no curves greater than 4 deg.

Provision has been made for paving certain sections of the highway with granite block where traffic is heavy.

Modern road-building machinery to the value of approximately $2,500,000 is now in use on the Central Highway construction. Some of this equipment is being operated day and night to insure rapid completion of the project.

In addition to the highway itself, hundreds of culverts and bridges are being constructed. Those of a span of less than 30 meters are built of concrete and those having a span greater than 30 meters are constructed of steel. Many improvements are also being made in the towns through which the highway passes. These improvements consist of drainage structures, curbs, gutters, sidewalks and parks.

This great project is part of the public works plan of General Gerardo Machado, President of Cuba, which is being carried out by the Secretary of Public Works, Dr. Carlos Miguel de Cespedes. The engineering is under the direction of Señor Manuel A. Coroalles, chief engineer of the Bureau of Roads and Bridges of the Department of Public Works. For Warren Brothers Co., Horace W. Ash is vice-president and William C. McDonald manager of Cuban operations.



FILLS are allowed to settle one year prior to finishing subgrade and placing concrete base course.

CONVENTION

A few of the officers and will direct the big meeting Builders' Association

Col. R. Keith Compton, president of the American Road Builders' Association, will preside at the opening session of the Cleveland convention at 10 a.m. Tuesday, Jan. 15. Colonel Compton, a road builder of many years' experience, is director of the Department of Public Works of Richmond, Va. Previously he held the position of chairman and consulting engineer of the Paving Commission of Baltimore, Md. During the World War he served as Major of Engineers, U. S. Army, and was subsequently promoted to rank of lieutenant-colonel in the Engineer Officers' Reserve Corps. Prior to his election to the presidency of the American Road Builders' Association, Colonel Compton had served as director and vice-president.

C. N. Conner, recently named to fill the newly created position of chief engineer of the American Road Builders' Association, will act in the important capacity of chairman of the Convention Program Committee. His experience covers service with the Highway Research Board, and the state highway departments of Delaware and North Carolina.

Octavio Du Bois, president of the Association's Pan-American Division and president of the National Highway Commission of Mexico which is engaged on an extensive program of road building.

S. M. Williams, former director of the Association, who will share, with W. L. Collins, the responsibility of presiding at the two Constructors' sessions.

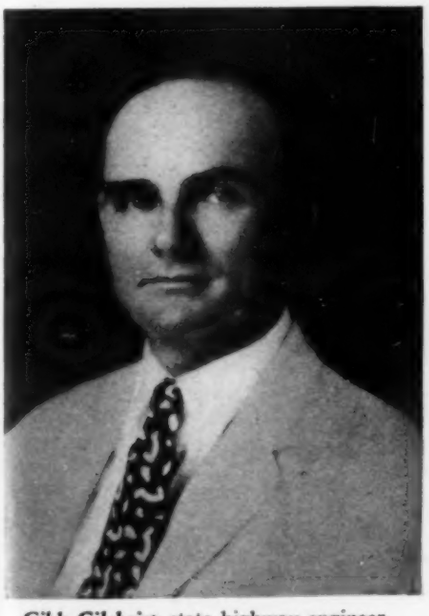
Thomas J. Wasser, past-president of the Association, who will direct proceedings at the County Officials' Session.

PERSONALITIES

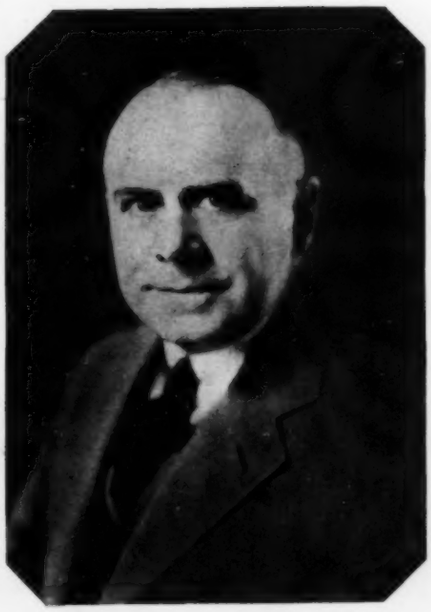
committee chairmen who of the American Road in Cleveland, Jan. 14-18

Lion Gardiner, president of the Association's Manufacturers' Division and vice-president of the Lakewood Engineering Co., of Cleveland. His convention responsibilities center on the huge exhibit of construction equipment and materials that will be on display in the Cleveland Auditorium.

Charles M. Upham, secretary-director of the American Road Builders' Association, and manager of the Road Show at the Auditorium. Mr. Upham, for years past, has been a leading figure in the Association's affairs. His professional experience covers service with the state highway departments of Massachusetts, Delaware and North Carolina—with the latter two as chief engineer. A more recent post he has filled has been director of the Highway Research Board of the National Research Council.



Gibb Gilchrist, state highway engineer of Texas, who will preside at the Engineers' Session of the convention, Jan. 16.



Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, Washington, D. C., and presiding officer with Mr. DuBois, at the convention's Pan-American Session on Jan. 16. Mr. MacDonald is a former chief engineer of the Iowa State Highway Department.

Captain H. C. Whitehurst, president of the Association's City Officials' Division and assistant to the Engineer Commissioner, Washington, D. C.

Paving a Town

With One Construction Crew

(Left to right) E. L. ALLEN, resident engineer for Robert & Company; R. S. AVERITT, Robert & Company, and S. D. TITTLE, chairman of street committee, Thomasville, Ga.

GOOD management and dependable equipment made it possible to pave Thomasville, Ga., a city of 10,000 population, with one construction crew in 12 months. The Wesco Company of Chattanooga, Tenn., was awarded the paving work in two contracts. Mannye Russ, superintendent, kept his force going at top speed by shifting the men to best advantage.

The main items of construction were as follows: 72,600 yd. excavation; 54,100 lin.ft. sewers, 6-in. to

CURB AND GUTTER trenches were cut with a standard Barber - Greene ditcher.

SHEET ASPHALT *(left)* was sealed with 10-ton rollers. Two tandem rollers and one three-wheel machine were used.

BROOMING *(right)* the surface of the concrete base provided better bond between it and the asphalt binder course.

36-in.; 104,500 lin.ft. curb and gutters; 55,400 sq.yd. concrete sidewalk; 148,000 sq.yd. 4-in. concrete base; 41,000 sq.yd. 5-in. concrete base; 194,000 sq.yd. 1½-in. binder; 46,700 sq.yd. 1½-in. sheet asphalt, and 147,400 sq.yd. 1-in. sheet asphalt.

The Simplicity asphalt plant of the Wesco Company played an important part in the speedy completion of the work. It was moved to the site of the central materials yard on railroad cars. The plant has two dryer drums. Cold aggregates are dumped into the outer drum, through which the hot gases pass on their way from the inner drum to the dust collector. Aggregates move from the outer drum to the inner drum, where they meet gases fresh from the firebox. They then drop through the "hot sand pipe" to an elevator which lifts them to a screen over the bins above the mixer.

Good average daily runs were made in all departments of the work. The high marks were: curb and gutter, 1,318 lin.ft.; sidewalk, 557 sq.yd.; concrete base, 3,846 sq.yd.; asphalt binder, 5,958 sq.yd., and asphalt top, 6,066 sq.yd. More than 126,000 sq.yd. of binder and sheet asphalt were put down in 57 working days. By using a ditcher and a central mixing plant, an average of 950 ft. a day of combined curb and gutter, including driveways, was constructed.

Robert & Company, Inc., Atlanta, Ga., supervised the design and construction. E. L. Allen, resident engineer, was in charge at Thomasville, acting under the direction of R. G. Hicklin, Atlanta.

FIRE WAGON *(below)*, equipped with rubber tires. This home-made truck scatters no ashes along the street.

M. RUSS, superintendent for the Wesco Company.

STEAM COILS *(below)* for the asphalt storage tank were placed in a pit below the level of the concrete floor.

ASPHALT PLANT *(above)*, with a truck loading beneath the mixer. A pipe from the exhaust fan maintained a partial vacuum in the dust collector.

A 10-TON ROLLER *(left)* scarified and rolled the subgrade. Thickness of the base and asphalt courses was varied to meet requirements of light and heavy traffic streets.

WIDENING HIGHWAYS IN

RECONSTRUCTION of existing highways to provide for the enormous traffic of today is a problem pressing many cities, counties, and states for solution. Trunk roads near large centers of population are the first traffic arteries to demand attention from state highway departments. In Maryland, the boulevard between Baltimore and Washington carries more than 6,000 vehicles in 12 hours.

The road was only 20 ft. wide. In 1928, the State Roads Commission began the work of widening the boulevard. A contract was let to Thomas, Bennett & Hunter, of Westminster, Md., to build concrete shoulders 10 ft. wide and 9 in. thick along both sides of the existing pavement for 3.7 miles at Laurel, Md. The J. L. Robertson Construction Company, of Baltimore, was awarded the contract for resurfacing the old pavement with 2 in. of bituminous concrete. T. A. Ward, of Baltimore, extended the concrete arch bridge at the Little Patuxent River to increase the roadway width from 24 ft. to 40 ft. while the Luten Bridge Company, of York, Pa., made extensions to three smaller concrete structures.

ONE LANE is completed before grading equipment is allowed to block the opposite side of the boulevard.

CEMENT is distributed on platforms along the subgrade.

BENT STAKES hold the 2x4-in. side form on top of the old pavement. The stakes fit into slots in the 2x4's, leaving a smooth surface for the screeds.

CEMENT is carried from the platforms to the mixer skip. Two longitudinal reinforcing bars are placed along the inside edge of the 10-ft. concrete shoulder.

THREE STATES:—*Maryland*

SILICATE OF SODA is sprayed over the slab as soon as the concrete is hard enough to walk on, the surface thus being sealed for the curing period.

The old pavement consisted of a 14-ft. asphaltic macadam center strip with concrete shoulders 3 ft. wide and 8 in. thick along both sides. Because a 2-in. course of bituminous concrete was to be placed on the old pavement, it was necessary that the new shoulders be constructed with their surfaces 2 in. above the level of the old roadway. Side forms to provide the 2 in. of elevation were made by laying 2x4's on the old shoulder and clamping them with bent steel stakes. Concrete was poured against the old slab.

Traffic used the highway continuously during reconstruction. One shoulder was built at a time. Mixer and trucks traveled on the old pavement to avoid rutting of the subgrade. Aggregates were hauled by twenty 5-ton trucks from a sand and gravel plant 10 miles away. Cement was shipped by rail to Savage, Md., a few hundred yards from the road and was distributed on platforms along the subgrade. Laborers carried the sacks from the platforms to the mixer. This system of handling the cement permitted the 5-ton trucks to make their long trip with aggregates for three six-bag batches, instead of with three five-bag batches, as would have been necessary if cement had been hauled at the same time.

The concrete was finished with two heavy screeds, 12 ft. long and 12 in. wide, and with a two-man float. Wet burlap was placed over the concrete until it was hard enough to bear a man's weight. Silicate of soda solution (water glass) then was sprayed over the surface to seal it. This seal coat prevented loss of water by evaporation and held in the slab all water necessary for complete hydration of the cement. No other curing agent was needed.

Material for the bituminous surface was hauled in trucks from the Baltimore plant of the J. L. Robertson Construction Company to the job, an average distance of 20 miles. It was dumped, spread, and raked uniformly to give a finished compressed thickness of 2 in.

Reconstruction of the boulevard was under the supervision of the State Roads Commission, John N. Mackall, chairman and chief engineer, and H. D. Williar, Jr., assistant chief engineer.

H. D. WILLIAR, JR. *(left)* assistant chief engineer, Maryland State Roads Commission, and T. A. WARD, bridge contractor.

BITUMINOUS CONCRETE is spread and rolled on the old pavement to a depth of 2 in. Traffic uses the outside lanes during this phase of the reconstruction.

WIDENING HIGHWAYS:—

(Continued)

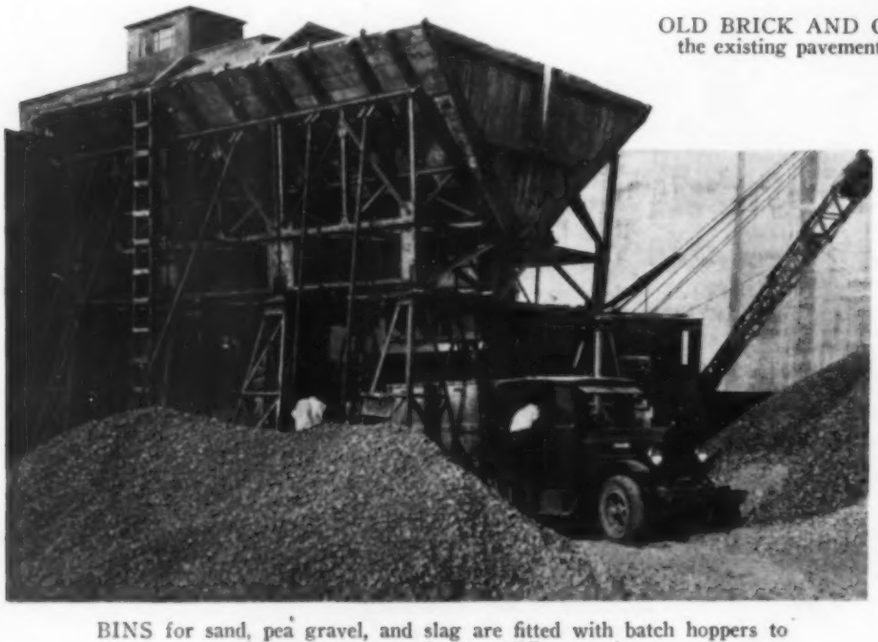
KENNETH BARBER, superintendent for the Harrison Engineering & Construction Company.

THE Lake Shore Road leading from Buffalo to Erie and Cleveland was widened at several places in New York State during 1928. Two important contracts, for adjoining sections not far from the city limits, were completed by the Harrison Engineering & Construction Company, of Buffalo.

One contract covered the construction of a 40-ft. concrete slab, in four 10-ft. strips 9 in. thick, from Lackawanna to Athol Springs, a distance of 3½ miles. The slab was laid on top of a 6-in. slag and cinder fill spread and rolled over the existing 16-ft. brick pavement. On the second section, also 3½ miles long, from Athol Springs to Wanakah, the existing 17-ft. brick pavement was used as the base for a 2-in. bituminous macadam top course. Concrete shoulders 11½ ft. wide increased the width of the road to 40 ft.

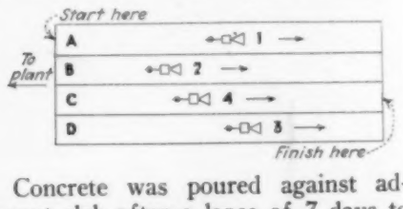
Two mixes were used in the slab. A 7-in. bottom course was composed of 1:2:3½ concrete, with slag as the coarse aggregate. The 2-in. top course was 1:1½:2 concrete, with pea gravel as the coarse aggregate. Welded wire mesh reinforcing was placed between the top and bottom layers of the monolithic concrete slab. Sand, gravel and slag bins were erected at a railroad siding 2½ miles from the Buffalo end of the job and were kept filled by a Northwest gasoline crane. Materials were hauled in batch boxes by a fleet of from seven to ten trucks. Each truck carried two seven-bag batches.

OLD BRICK AND CONCRETE are removed where the existing pavement interferes with the new grade.



BINS for sand, pea gravel, and slag are fitted with batch hoppers to measure aggregates for two different mixes.

On the first section, where four 10-ft. lanes were constructed, the procedure in building short portions of the road was to lay one strip at a time, in the order indicated by the sketch.



Concrete was poured against adjacent slab after a lapse of 7 days to prevent bonding, and the green slab was closed to traffic for 21 days. In laying A, B, and D consecutively, as shown, no delay was experienced because a lane always was open for trucks and the slab always was 7 days old by the time the mixer started on an

New York

BATCH BOXES are used in order to keep trucks off the subgrade.

BROOMING of the slab gives it a rough, non-skid surface.

adjoining strip. By placing D third and C fourth, the 21 days needed to cure B had elapsed when the mixer was ready to start on C. Trucks then could haul on B to the mixer paving C. This general scheme was the best where straight going was possible. At many places, the method had to be varied to suit restricting conditions.

On the second contract section of 3½ miles, excavation for the two 11½-ft. outside lanes was made to a depth 13 in. below the surface of the existing pavement, and the 9-in. concrete slab was placed on a 6-in. fill of slag and cinders. The top of the slab was 2 in. above the existing pavement. A 2-in. course of asphaltic macadam was applied to the old pavement, making the surface flush with the new concrete shoulder.

All concrete was finished with heavy two-man and four-man screeds, and the slab was floated, broomed, and covered for 24 hours with wet burlap. Curing was completed with wet straw. The width of the strips varied. As Superintendent Kenneth Barber had no finishing machine with floating wheels, he elected to do all the finishing by hand.

Operations were supervised for the New York Commission of Highways by Assistant Engineers H. L. Ludden and R. M. Howard, acting under Division Engineer Charles R. Waters, Buffalo, N. Y.

METAL CLIP and stakes hold expansion joint strip in place temporarily. Note different mixes for top and bottom of slab.

WIDENING HIGHWAYS:—*Michigan*

(Continued)

THE Wayne County Road Commission, under contract to the Michigan State Highway Department, last fall completed 2½ miles of widening on the Telegraph Road, the main highway between Detroit and Toledo. To the old pavement of 9-in. concrete slab, 20 ft. wide, were added two outside lanes 10 ft. wide and 10 in. thick, making a total roadway width of 40 ft.

All materials were hauled from the unloading point to the mixer by industrial railway. Four Plymouth 7-ton locomotives pulled trains of 16 cars each. The total length of track was approximately 7½ miles.

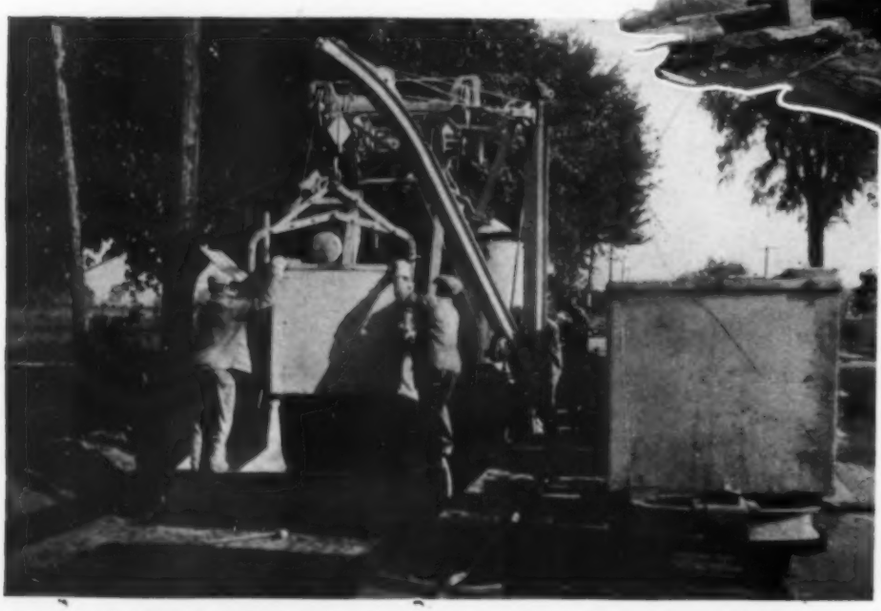
Aggregates were shipped to the materials plant by rail, while cement was hauled from the mill by truck. A Browning locomotive crane unloaded cars of sand and gravel with a clamshell bucket. The material was placed in stock piles or was dumped into Blaw-Knox movable bins of 45-ton capacity. A Lakewood finishing machine completed the concrete surface.

G. C. Dillman, chief engineer of the Michigan State Highway Department, exercised general supervision over the work. R. J. De Mond was project engineer, and R. N. Bird was superintendent.

MOVABLE BINS load the batch boxes carried on industrial cars. A locomotive crane handles the materials.

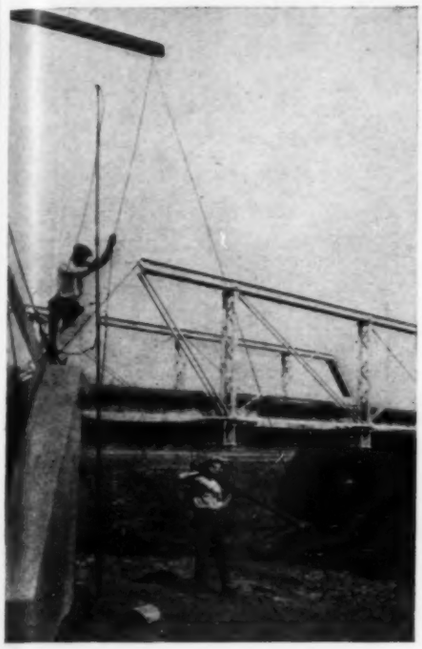
TAMPING TOOL with broad flat face packs earth under forms in making grade adjustments.

FORM PULLERS, hooked to top flange, lift both rail and stakes.



INDUSTRIAL TRACK is laid on the old slab adjacent to the widening strip. It acts as a barrier to keep traffic off the green slab.

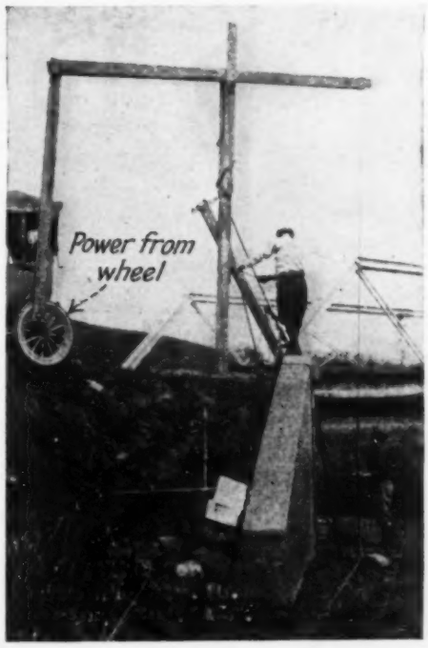
Miniature Oil Well Rig for Drilling
TEST HOLES



MUD PUMP, or bailer, being emptied after being pulled out of hole. Drill bit and stem held by man at left.

A MINIATURE oil well drilling outfit for sinking test holes in making landslide investigations and in determining foundations for bridge abutments has been developed by Division 10 of the Ohio Department of Highways with division office at Marietta, Ohio. Stem, bit and bailer resemble closely the tools used in drilling for oil and gas. Several methods of operating the drill are employed.

One of the photographs shows the rig being driven by a walking beam from the rear wheel of a Ford car. In this instance, conditions were suitable for such a hook-up. The car was parked on the road, and the hole to be drilled was started at an elevation considerably below the level of the car.



WALKING BEAM, connected to the rear wheel of a Ford, operated the drill rig at this site.

Hand Power May be Used

In most cases, bridges are constructed on new locations, and it is impossible to use a car as the source of power. Other means of sinking the hole then are employed. These may be hand power, a spring pole, or a taut line alternately slacked and tightened by a cam, motor driven.

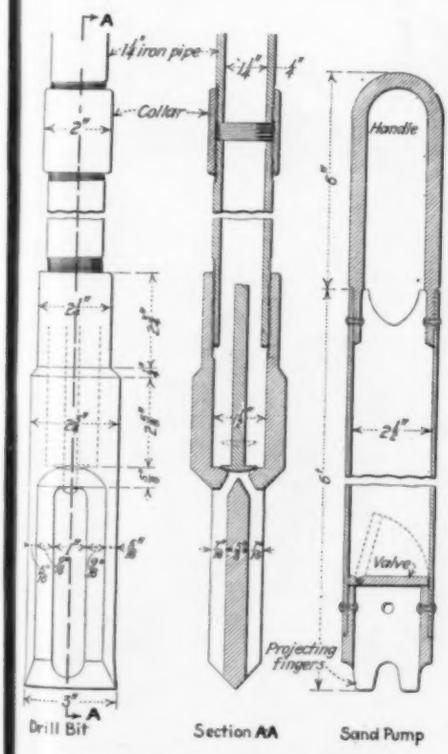
One of the line drawings shows the method of connecting a cross-arm to the drill stem in sinking the hole by hand. Two or three men raise and lower the drill by means of the cross-arm. This method would seem to demand much fatiguing labor; but, as a matter of fact, two or three men can put down a 20 to 30-ft. hole in a short time. The cost of drilling is less than 45c. a ft.

The drilling outfit consists essentially of a drill bit attached to a stem made up of sections of 1¼-in. pipe with screwed joints. Sections are added to increase the length of the stem as the hole deepens. The other essential part of the equipment is the mud pump, called in oil well drilling parlance, a bailer. This is merely a tube with a butterfly valve in the lower end which opens when the bailer is dropped in the mud and closes when it is pulled out.

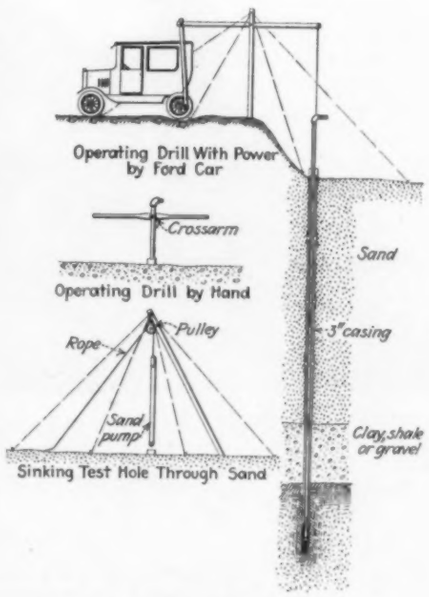
Soil Conditions Determine Methods

Other features of the outfit are dependent on the soil encountered in the drilling. Where a hole is started in soft ground which caves easily, it is often necessary to incase the hole with 3-in. pipe for a certain distance. Where the soil is stiff and well bonded, rapid progress can be made at the start of a hole with a miner's auger. The cost of bit, bailer, and 28-ft. stem in four pieces, as purchased by Division 10, was approximately $40. When rock is encountered in the drilling, the hole is carried 3 ft. into the rock to make sure that it is a dependable stratum and not a thin layer or boulder.

Construction Methods is indebted to A. W. Sherwood, assistant on construction to O. W. Merrell, resident division deputy director, Division 10, Marietta, Ohio, for the illustrations and data offered here.



EQUIPMENT used in drilling test holes—drill bit and sand pump.

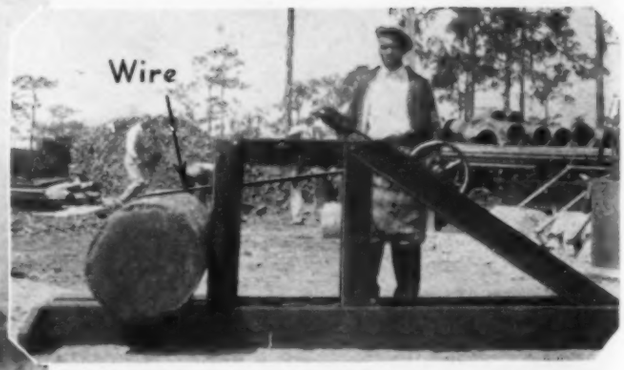


THREE METHODS of operating the drill rig: by power from Ford car, by hand, and by line and pulley.

Getting Down to DETAILS

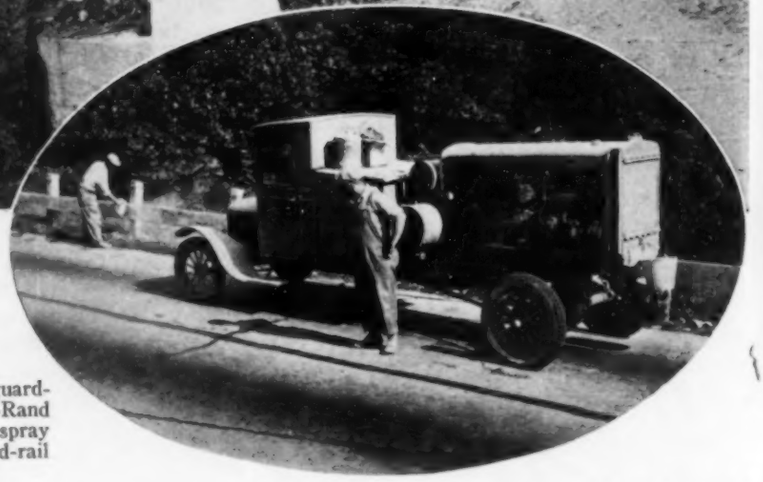
Close-up Shots of Job Methods and Equipment

DROP HAMMER on power shovel boom breaks up old 7-in. pavement slab in Michigan. *Photo from* **B. C. TINEY** *Maintenance Engineer, Michigan Highway Dept.*

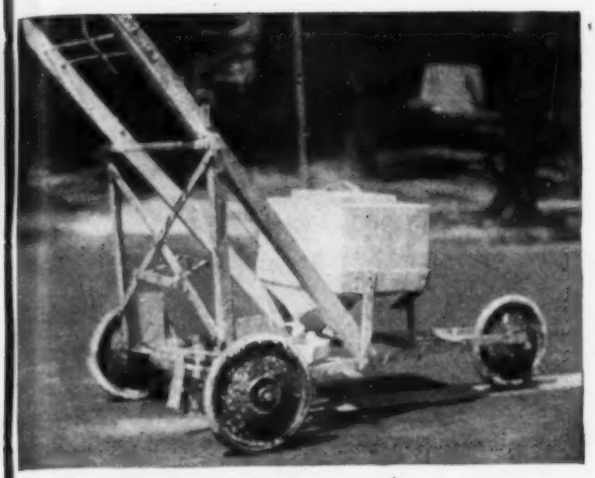


CUTS ASPHALT BARRELS. Wire connected to chain from hand winch on wood frame proves labor saver in opening drums in hot weather. *Photo from* **Y. BRIDDELL** *Georgia Engineering Co., St. Petersburg, Fla.*

HIGHWAY SHOULDERS *(above)*, as built up by Moyer Brothers, contractors of Troy, Ohio, using a Miami backfiller operated by cable from winch on tractor. Two furrows plowed in ditch at roadside supply fill for shoulders.

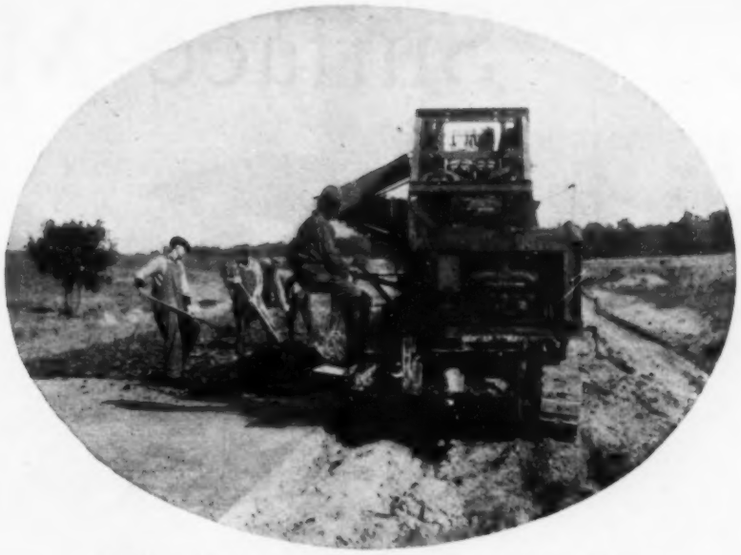


FOR SPRAY PAINTING *(right)* of highway guard-rail Ohio Highway Department uses Ingersoll-Rand air compressor, on truck, serving two Chicago spray guns. Outfit paints 1,200 to 1,500 lin.ft. of guard-rail per day.

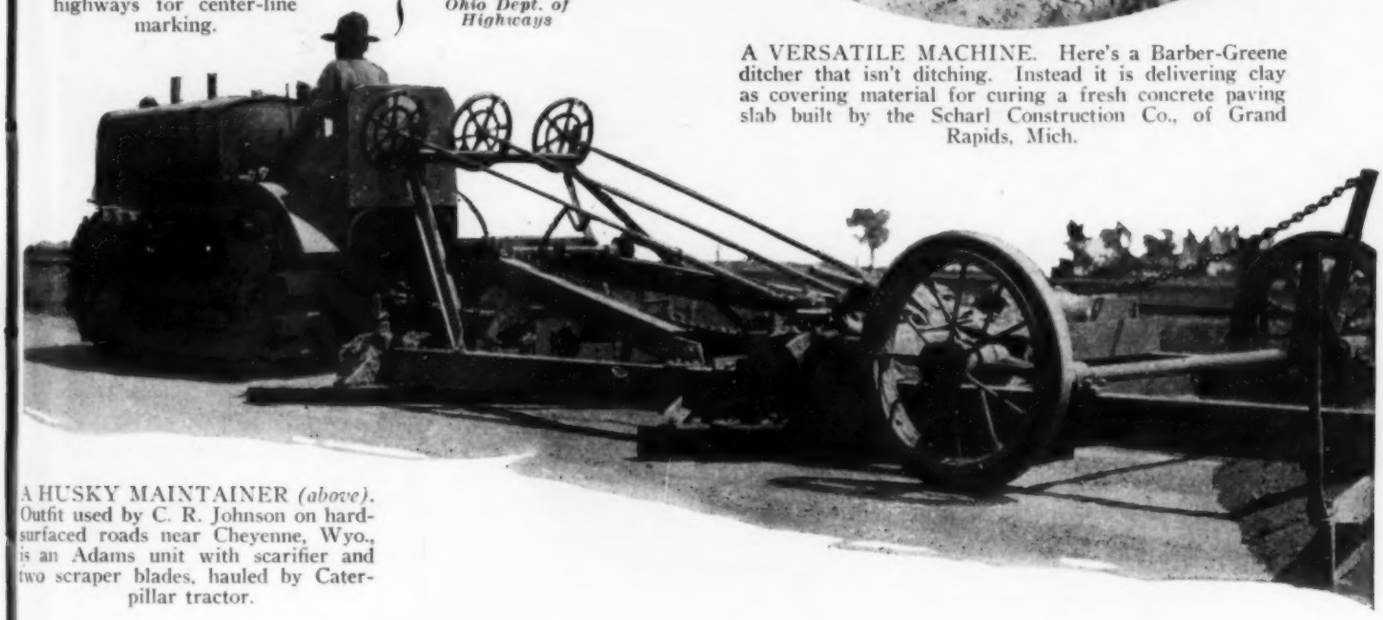


TO PAINT TRAFFIC LINES. Rig used on Ohio state highways for center-line marking.

Photo from **HARRY E. NEAL** *Traffic Engineer, Ohio Dept. of Highways*



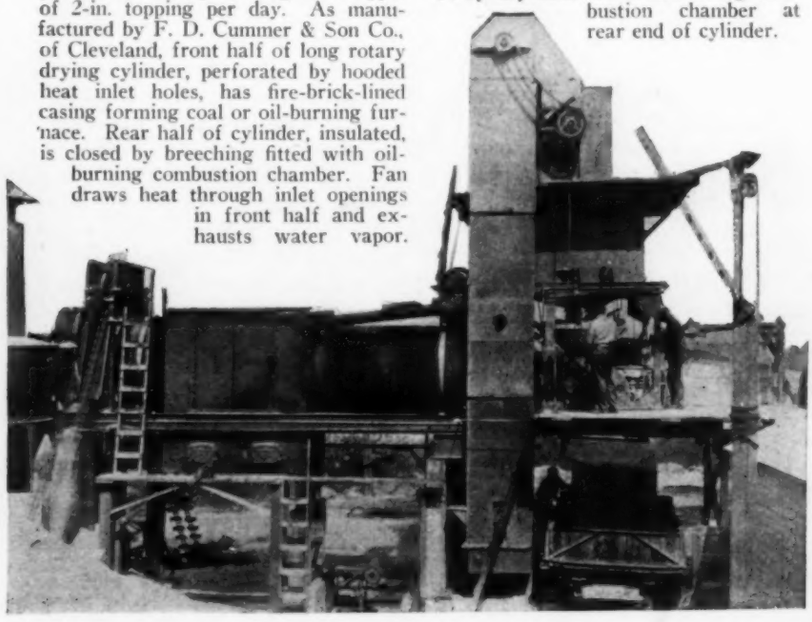
A VERSATILE MACHINE. Here's a Barber-Greene ditcher that isn't ditching. Instead it is delivering clay as covering material for curing a fresh concrete paving slab built by the Scharl Construction Co., of Grand Rapids, Mich.



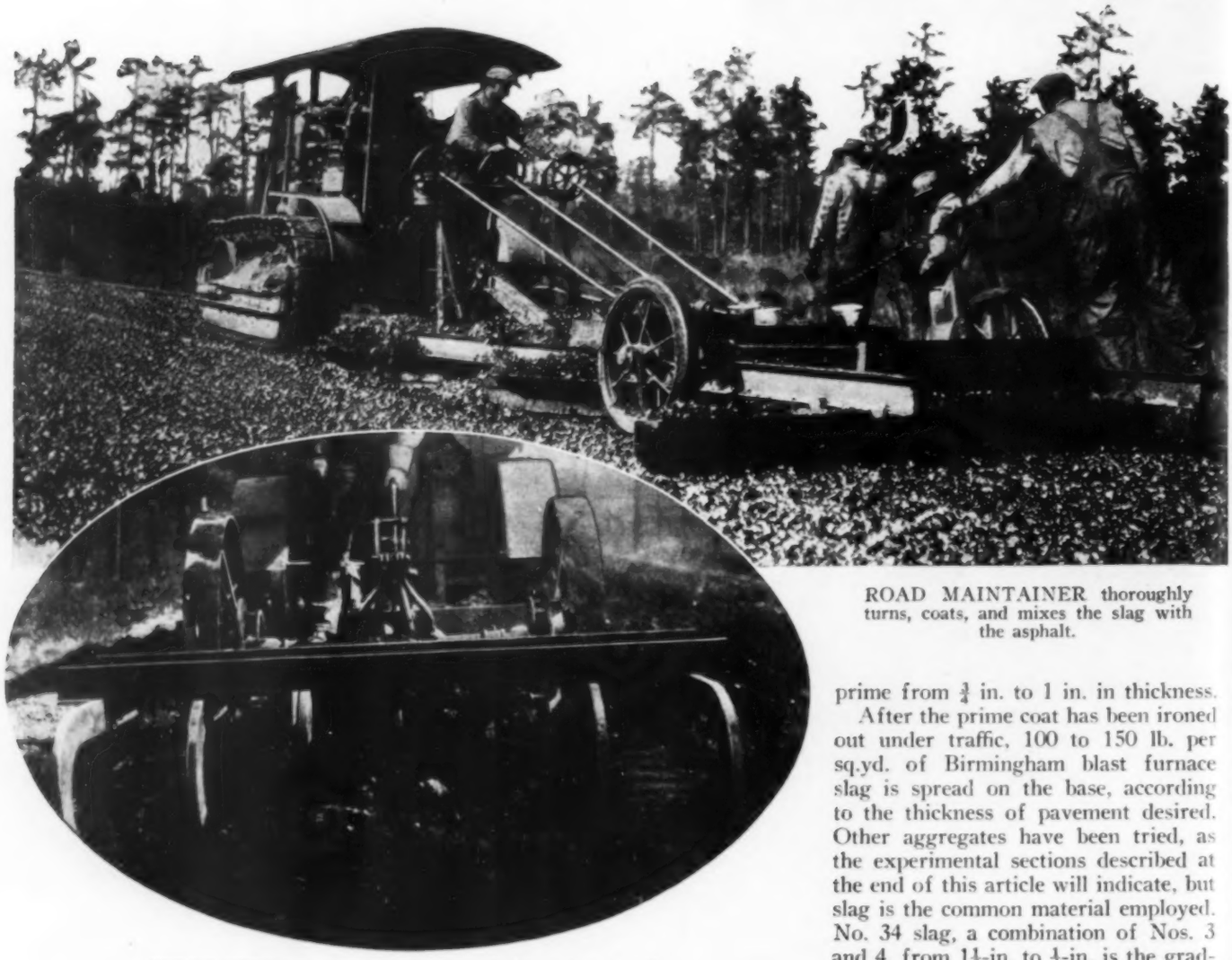
A HUSKY MAINTAINER *(above)*. Outfit used by C. R. Johnson on hard-surfaced roads near Cheyenne, Wyo., is an Adams unit with scarifier and two scraper blades, hauled by Caterpillar tractor.

WOODEN RACKS *(below)* in which brick are stacked, simplify handling of materials on city paving job.

TWO-FIRE DRYER *(below)* for mineral aggregate is feature of John McCourt Company's asphalt paving plant in Boston, producing 2,500 sq.yd. of 2-in. topping per day. As manufactured by F. D. Cummer & Son Co., of Cleveland, front half of long rotary drying cylinder, perforated by hooded heat inlet holes, has fire-brick-lined casing forming coal or oil-burning furnace. Rear half of cylinder, insulated, is closed by breeching fitted with oil-burning combustion chamber. Fan draws heat through inlet openings in front half and exhausts water vapor. Sand and stone, warm and almost dry when they pass last heat inlet, are then heated to from 200 to 500 deg. F. by dry heat from oil-burning combustion chamber at rear end of cylinder.



Surface-Mixed Asphalt C



ROAD MAINTAINER thoroughly turns, coats, and mixes the slag with the asphalt.

FIRST STEP in preparing the clay-gravel base is to scarify the old road and add gravel.

AN economical surface for light traffic roads has long been a subject of interest to highway engineers. The Georgia Highway Department, under the direction of W. R. Neel, state highway engineer, is experimenting at present in the use of slag or other aggregate mixed with cold asphalt on a clay-gravel base. Mixing is done on the road with a highway maintainer. The experiments have demonstrated the practicability and advantages of surface mixing and have developed several satisfactory types of bituminous concrete surface.

The experiments are being conducted by B. P. McWhorter, engineer in charge, on the highway between Dupont and Waycross, in Clinch and Ware Counties. A total distance of 33.2 miles is being paved. As the old clay-gravel road has been half worn out under traffic, the first step in the process of reconstruction is to scarify the base and build it up to true cross section by the addition of gravel. The base is made at least 6 in. thick. Traffic is allowed to use it until it is thoroughly compacted.

When the base is in condition to receive the top course, it is wet with a water truck and is scarified to 1-in. depth with a fine tooth harrow or with a Killifer power lift chisel scarifier, which is a better machine for this purpose. After the surface is thoroughly scarified to a 1-in. depth, ½ gal. per sq.yd. of liquid asphalt is applied and is allowed to penetrate for 24 to 48 hours. At the end of this time, pea gravel, sand, or other suitable material is scattered over the surface to permit rolling with a 12-ton three wheel roller. Traffic then is allowed to use the base to iron out the prime coat. The process leaves a tough, waterproof prime from ¾ in. to 1 in. in thickness.

After the prime coat has been ironed out under traffic, 100 to 150 lb. per sq.yd. of Birmingham blast furnace slag is spread on the base, according to the thickness of pavement desired. Other aggregates have been tried, as the experimental sections described at the end of this article will indicate, but slag is the common material employed. No. 34 slag, a combination of Nos. 3 and 4, from 1½-in. to ¼-in. is the grading most often used. A pavement thickness of 1½ in. is compacted from 100 lb. of this material, while a 2-in. course is constructed from 150 lb.

The Mixing Machine

To the slag is applied 1 gal. of cold mix asphalt in two applications of ½-gal. each with a distributor. Close behind the distributor follows an Adams No. 6 maintainer, which turns over the slag and mixes it with the asphalt. The mixing machine, as the photograph indicates, is equipped with three pairs of blades set at an angle and with a straight blade at the rear. The front pair of blades cuts to the base of the pavement, the second pair cuts to a lesser depth, and the third pair turns over the top ¼ in. Even distribution of the material is obtained by the rear blade, which strikes off the true surface of the pavement. In its two rounds behind the distributor, the maintainer turns over the material eight times and thoroughly coats the

Cuts Construction Costs

slag with asphalt. The process eliminates the difficulty met in the penetration method of completely penetrating and coating the aggregate. At the end of the second trip of the maintainer, the material is thoroughly mixed and is uniform in color.

The Rolling Operations

When the material has been mixed and struck off in this way, it is rolled with a 12-ton three-wheel roller. Rolling is resumed after 12 to 24 hours' curing, when the pavement has stiffened sufficiently to give it stability. After the second rolling, 15 lb. of No. 6 slag ($\frac{5}{8}$-in. to $\frac{1}{4}$-in.) is spread over the surface and is rolled and swept into the voids by a roller equipped with a broom.

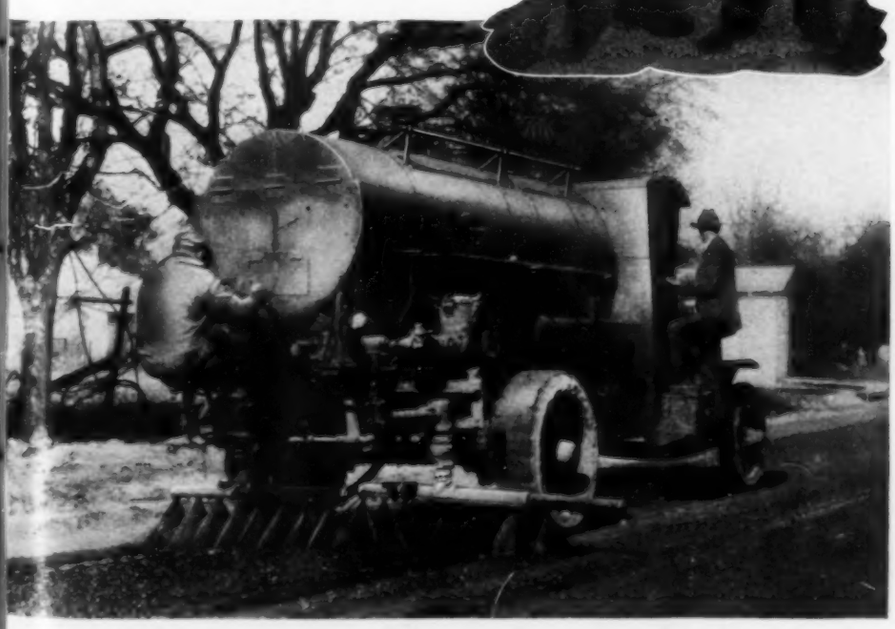
After traffic has used the road a sufficient length of time to iron the fine slag into the voids, $\frac{1}{4}$ gal. of cold mix asphalt is applied to seal the surface temporarily, and the pavement is again rolled. At the end of 60 or 90 days, or whatever period is necessary for thorough curing of the asphalt, $\frac{1}{4}$ gal. of hot asphalt is applied at 375 deg. F. and is covered with 5 lb. of No. 7 slag ($\frac{1}{4}$-in. down) or stone chips to form a seal coat and insure a waterproof surface.

Accurate records of the cost of constructing bituminous concrete surface by this method have been kept. The figures include depreciation of equipment but do not include interest on investment or profit, charges which would have to be added in contract work. To apply the prime coat to the clay-gravel base costs 8c. per sq.yd. For the various thicknesses of pavement, the records give the following approximate costs:

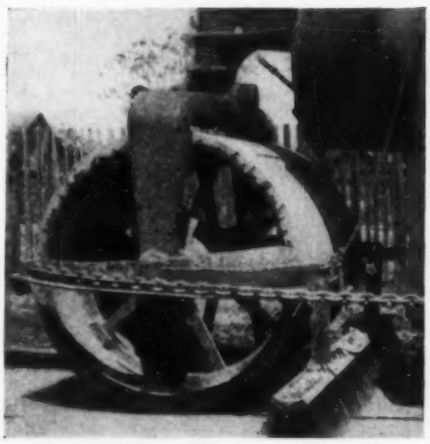
Thickness of pavement in in.	Quantity of slag in lb. per sq.yd.	Total cost cents per sq.yd.
1½	100	42.5
2	141	46.0
2½	175	49.5
2½	200	60.0
3	235-240	68.0-70.0

The Georgia pavement is thickened 2 in. at the edge. A special pointer, attached to the blade of a road grader, was invented by Superintendent D. B. Thompson to cut the trench along the margin of the base. Slag for the thickened edge is mixed with the rest of the material on the base and is cast into the trench by the maintainer. Elimination of special labor has reduced the cost of the thickened edge to 2½ or 3c. a lin.ft.

B. P. McWHORTER (*left*), is building the experimental sections with the aid of D. B. THOMPSON, superintendent.



PRIME COAT of liquid asphalt is applied to the clay-gravel base after it has been scarified to 1-in. depth.



BROOM attached to roller for sweeping fine material into voids.

Construction Methods is indebted to Mr. McWhorter, who both designs and builds the pavement, for the data and most of the photographs published herewith. Various designs have been tried. Early results of these experiments are given here. All types were laid on the substantial base described above.

Section A—Section A is composed of 140-lb. per sq.yd. of No. 34 slag, with the addition of 25 per cent of pea gravel ($\frac{3}{4}$-in. to $\frac{1}{4}$-in.) and 1 gal. of cold mix asphalt applied and mixed. After mixing and rolling, $\frac{1}{4}$ gal. of cold mix asphalt was applied and covered with 10 lb. of No. 6 slag. This type proved satisfactory.

Section B—This section is composed of 140 lb. of No. 34 slag, with the addition of 40 per cent of clean, coarse concrete sand and 1 gal. of cold mix asphalt, applied and mixed. The sand appeared to fill the voids thoroughly after rolling and gave the material a sheet asphalt appearance.

During the process of mixing, it was found that the sand had a tendency to segregate and ball, causing lean and rich streaks which were quite objectionable. Another objection was that, after rolling, the volatile oils were sealed, and the asphalt could not cure properly as in the open stone. After 3½ months under traffic, Section B appeared to be fairly satisfactory. It has, however, a tendency to push, forming a slightly wavy riding surface. Because of these bad features, this type is not to be recommended.

Section C—Section C is composed of 140 lb. of No. 34 slag with no other aggregate added. Cold mix asphalt, 1 gal. per sq.yd., was applied and mixed. After rolling, 12 to 14 lb. of No. 6 slag was swept and rolled into the voids, ¼ gal. of asphalt was applied, and the surface was re-rolled. This section appears to be the strongest of the three types so far described, and the results are entirely satisfactory. It is intended that this section be given a seal coat consisting of ¼ gal. of hot asphalt and about 5 lb. of stone chips.

Section D—This section is composed of 130 lb. of No. 2 slag (2¼-in. to 1½-in.), with 1 gal. of asphalt applied and mixed. After rolling, 25 lb. of No. 4 slag (¾-in. to ¼-in.) is added and rolled into the voids, ¼ gal. of asphalt is applied, and the surface is rolled again. After 24 hours, or as soon thereafter as feasible, 10 lb. of No. 6 slag is swept and rolled into the voids, another ¼ gal. of asphalt is applied, and the surface is re-rolled.

This section is stronger than any of the others described, and, if funds are available, it is recommended over all other types. A seal coat is to be applied to this, as on Section C, after all volatile oils have thoroughly evaporated.

Section E—On this section, instead of slag, 140 lb. of washed gravel (1½-in. down to No. 10 mesh) was applied. After this material was spread on the base, 1 gal. of cold mix asphalt was applied and mixed. After rolling with a 12-ton three-wheel roller, the road was thrown open to traffic.

This material appears quite dense, and, after proper curing, will need only a very light seal coat to insure a waterproof surface. The results are very satisfactory.

Section F—This section is composed of approximately 140 lb. of pit run gravel, ranging from 2 in. in size and containing 35 to 40 per cent of sand below ¼-in. mesh, with 1 gal. of cold mix asphalt added and mixed. After rolling the surface looked very dense and had a sheet asphalt appearance.

The objections to this type are that the surface is sealed after rolling, preventing escape of the volatile oils and causing slight shoving of the material under traffic, and that there seems to be segregation of the material during mixing. In some places there appeared to be very little asphalt, and in these spots the material disintegrated. About 10 per cent of this section, approximately 600 ft. long, has failed. The remainder appears to be in good condition and may prove satisfactory.

One cause contributing to the failure is the presence of excessive foreign matter in the unwashed gravel. This material is not recommended for cold mix bituminous concrete.

Three kinds of Mexican Petroleum asphalt have been used on the experimental sections. For the prime coat, liquid asphalt of 50-60 penetration, cut back with 30 per cent naphtha solvent, is applied. The top course at first was mixed with cold mix 40-50 penetration asphalt, cut back with 35 per cent light naphtha solvent. This material has been superseded by special mix 50-60 penetration asphalt, cut back with 20 per cent medium naphtha solvent. Better results are obtained with the latter material. To insure workability, it is heated with steam to 200 or 250 deg. F.

BITUMINOUS CONCRETE mixed by the surface method, as it appears under traffic.

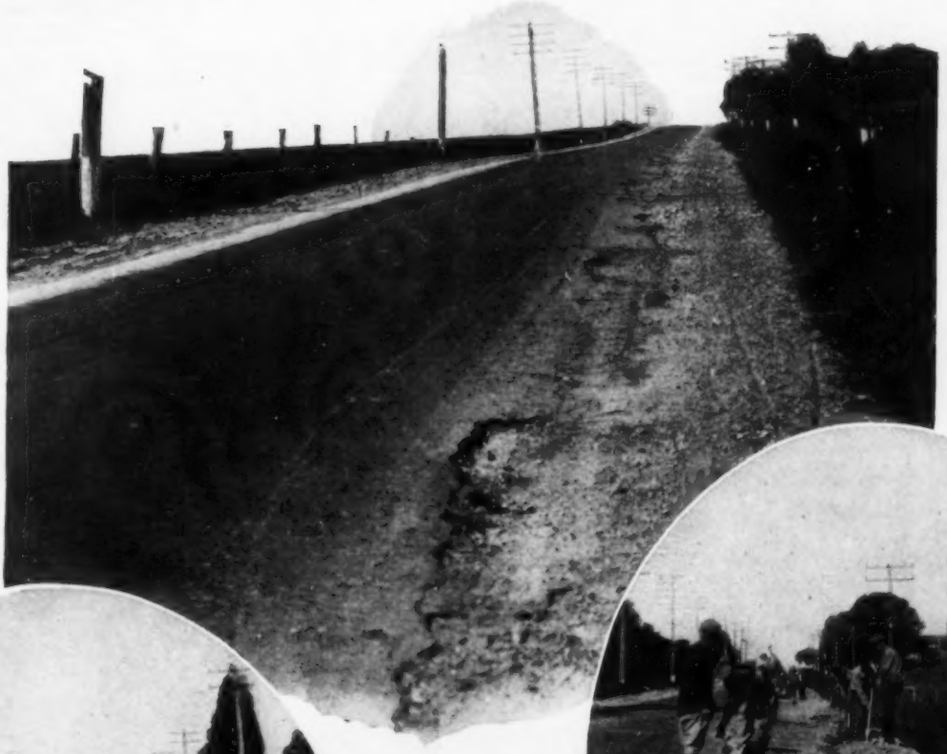
POINTER and blade extension, attached to grader, cut trench for thickened edge and smooth berm for side form.

SLAG for thickened edge is dumped on base along with rest of material. Maintainer then mixes it and casts it into trench.

Equipment Used

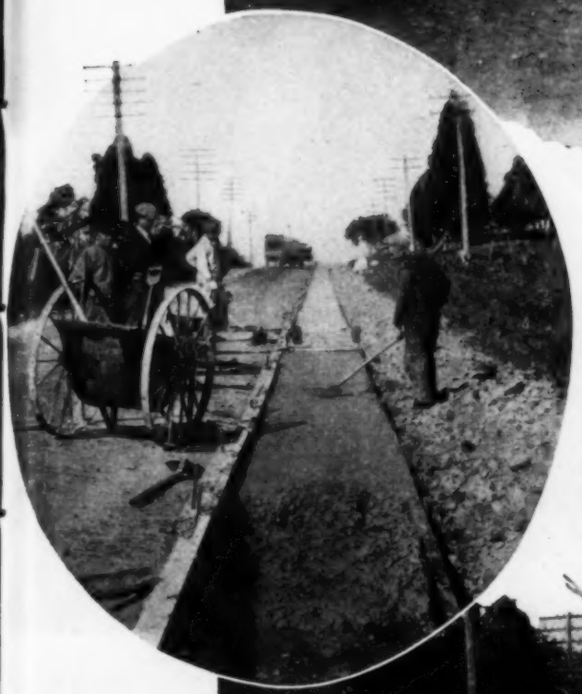
The quantity of equipment used for this work is not excessive. It consists of: two Caterpillar 60 tractors; one Russell Super-Mogul grader and scarifier; one Killifer road ripper with 7 teeth; one Killifer power lift chisel scarifier, 21 teeth, 3 in. c. to c.; two asphalt distributors; one 12-ton three-wheel steam roller; one water truck; five White 1½-ton dump trucks; seven International 1½-ton dump trucks; one P&H crane, handling ½-yd. clamshell bucket, mounted on a Mack truck; two 13,000-gal. asphalt storage tanks; one steam boiler; one steam pump; one 600-gal. superheater; one Adams No. 6 maintainer; one Shawnee grader, 12-ft. blade; one McCormick-Deering tractor; one 5-ton gasoline roller with broom attachment; and one turntable.

Concrete Shoulders *for Macadam Roads*



MACADAM ROADS of narrow width, in good condition, present a reconstruction problem in many states. Maryland was the first to preserve and improve such roads by widening them with concrete shoulders. Traffic has raveled the edge of this 14-ft. highway.

SUBGRADE *(below)* is trimmed and lines for the forms are stretched. The forms for the inside edge of the shoulder are lying on the macadam.



ADVANTAGES
of this type of improvement

Width increased.

Crown reduced.

Maintenance cost on edges lowered.

White line for night driving.

Shoulders constructed by contract. Backfilled with macadam by state forces. Total cost about $15,000 per mile.

CONCRETE SHOULDERS *(above)* 3 ft. wide and 8 in. thick increased the width of the road to 20 ft. To reduce the crown of the existing road forms are set from 3 to 5 in. above the macadam surface.

WIDENED from 14 to 20 ft. by adding two 3-ft. concrete shoulders to existing macadam. The crown has been reduced by filling in with macadam behind the shoulders.

PARABOLIC CURVE for 724-ft. long creosoted timber bridge across Bayou Lacassine, Louisiana, meets U. S. Government's requirements of 25-ft. clearance.

HIGHWAY B

Examples of Construction in Types of Steel, Concrete an

OPEN SPANDREL, TWO-RIBBED ARCH. Harlan D. Miller bridge, with 230-ft. concrete span, completed last year by California Highway Commission and named for its late bridge engineer. Contractors, Bordwell & Bruggs; resident engineer, W. H. Johnson. H. D. Stover is bridge engineer for the commission.

STEEL ARCH *(above)* of 480-ft. span for Logan bridge, a New Mexico Federal-Aid project.

STEEL TRUSS *(above)* of 261-ft. span carries state highway across Colorado River.

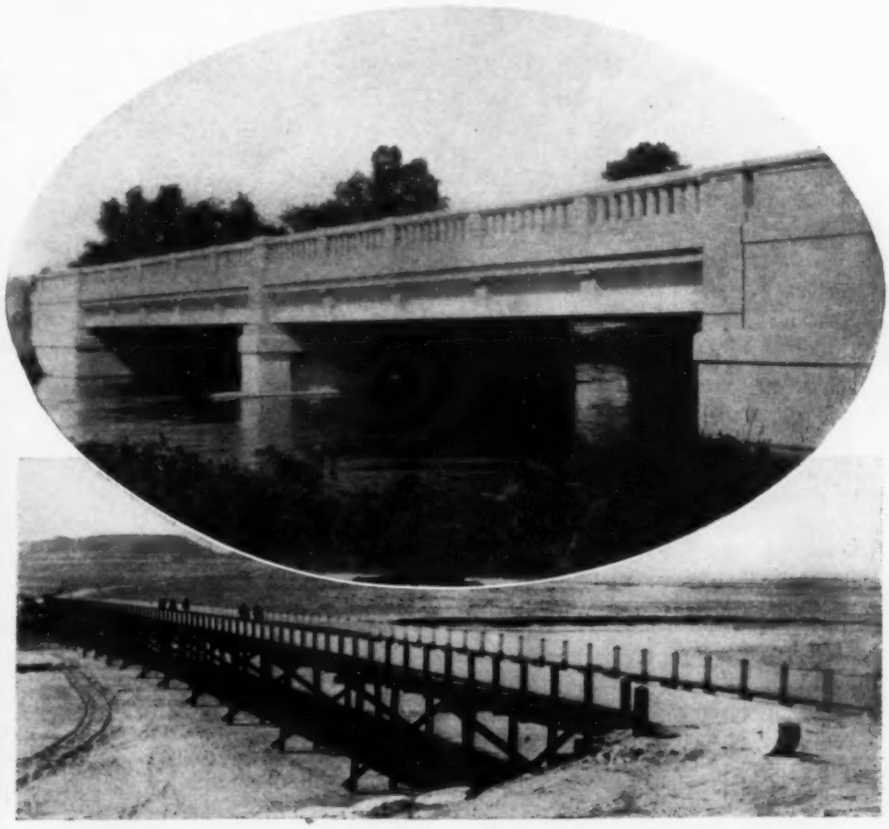
GRADE SEPARATION structure *(right)* of 82-ft. span plate girders at Huntsville, Ohio. Bridge constructed by C. C. C. & St. L. Ry. and paved by Ohio Highway Department.

CONCRETE THROUGH ARCH BRIDGE, 469 ft. long, over Great Miami River at Piqua, Ohio. An Ohio Highway Department project, W. H. Rabe, chief bridge designing engineer.

BRIDGES

in Many States Showing and Wood Structures

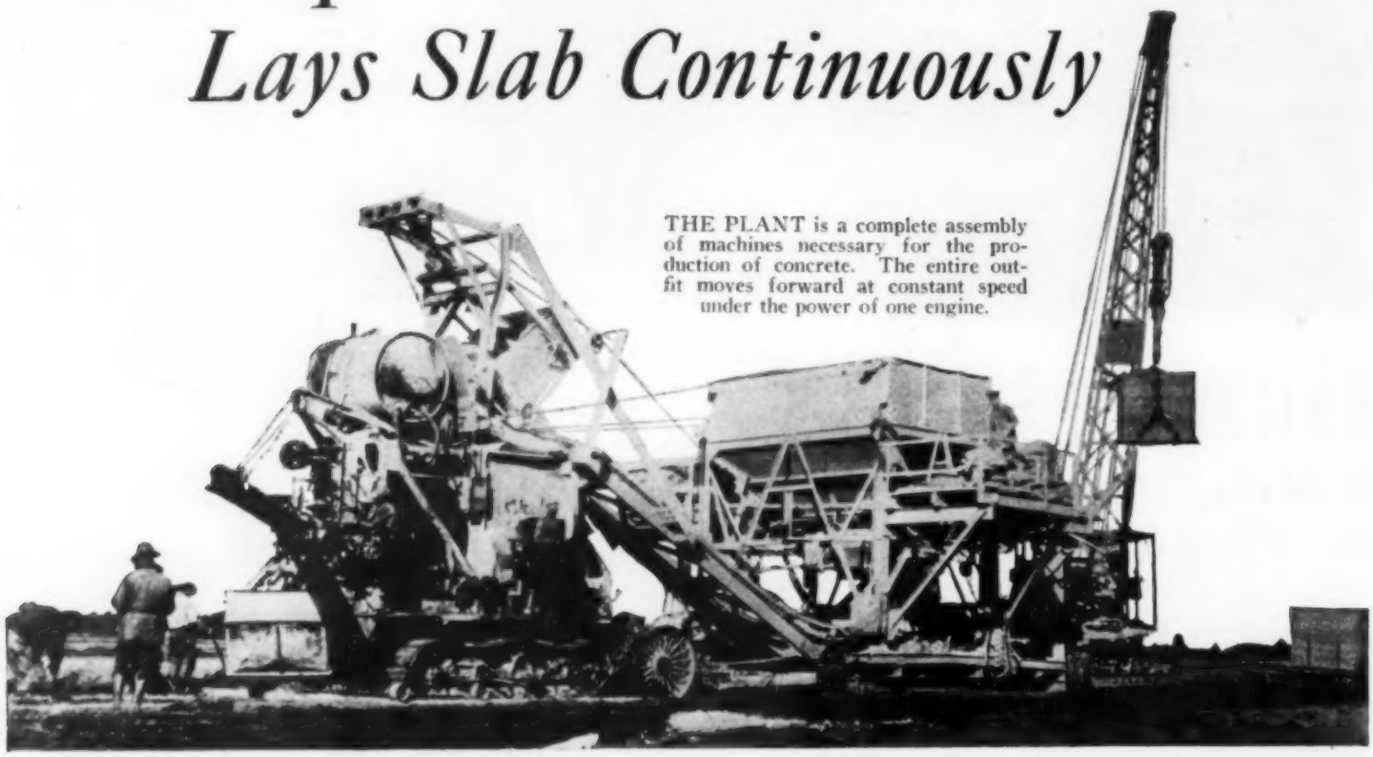
SEVEN-MILE TRESTLE with pre-cast concrete deck-slab units across San Francisco Bay, a Raymond Concrete Pile Co. structure.



CREOSOTED TIMBER State Line Bridge, Oklahoma-New Mexico, L. N. Swope & Son, contractors. GUARD RAIL TREATMENT *(in oval, above)* on Flint River bridge by Michigan Highway Dept., C. A. Melick, bridge engineer.

ACROSS COLUMBIA RIVER at Brewster, Wash. On Sunset Highway steel truss structure 1,596 ft. long on concrete piers forms $500,000 inter-county toll bridge, designed by Union Bridge Co., and built by Puget Sound Dredging Co.

Complete Portable Plant
Lays Slab Continuously



THE PLANT is a complete assembly of machines necessary for the production of concrete. The entire outfit moves forward at constant speed under the power of one engine.

THE well-known principle that a concrete paving job can earn a profit only while the mixer is laying slab was the basic reason for the development by G. P. Scharl, contractor, of Grand Rapids, Mich, of an outfit which permits uninterrupted production of concrete. During the summer of 1928, this outfit paved 14 miles of 20-ft. road on the direct route from Grand Rapids to Lake Michigan; it was operated by the Scharl Construction Company for the Michigan State Highway Department.

The outfit is a complete assembly of machines necessary for the production of concrete. Raw materials are received in bulk and are stored, proportioned, mixed and delivered to the subgrade. The three units of the plant are connected to form a train, and the whole outfit moves forward under the power of one engine.

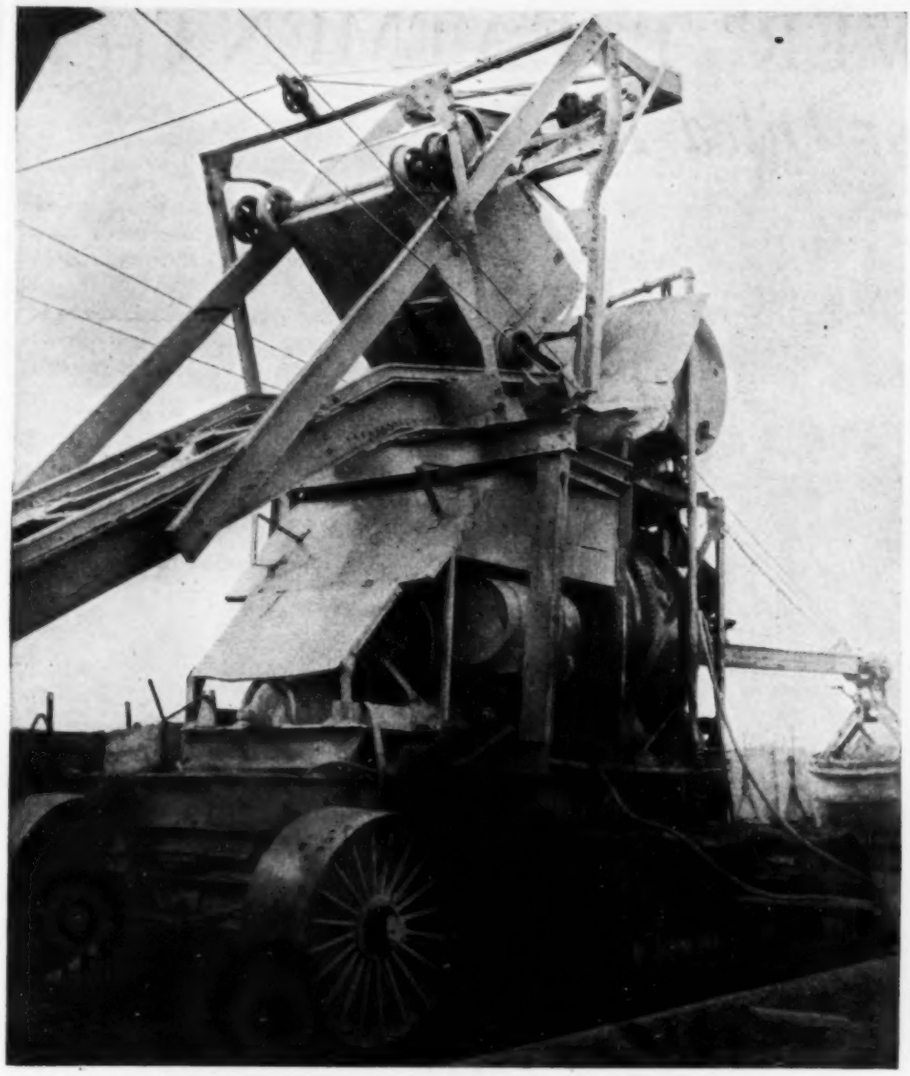
The three units comprising the plant are the mixer, bins, and crane. Storage of materials to permit continuous mixing between deliveries is the essential feature of the outfit. The bins hold 40 yd. of aggregates, and 360 sacks of cement can be carried on the platform. These quantities are sufficient to keep the plant working steadily through any ordinary delay in replenishing the supply.

GREAT STEEL WAGONS, full crawler-mounted, haul heaped loads of 18 yd. or more.

Locomotion—The middle unit of the train provides the locomotive power. It pushes the crane with a steel pipe pole and pulls the mixer by two chains. A tractor mounted on the steel frame is connected to the crawler traction through four gear reductions, giving a ratio of 4,400 to 1. Sprockets replace the wheels on the axle of the tractor. With the motor running in low gear, the outfit travels at a constant forward speed of 120 ft. an hour. When paving faster than 120 ft. an hour, the motor can be run in second or high gear.

Steering the heavy locomotive unit at first presented a problem. The solution was found in placing brakes on the axle on both sides of the differential. By applying pressure to either brake lever, motion on that side may be stopped while the sprocket on the other side continues to turn.

Inclined Hoist—An inclined hoist elevates batched materials from beneath the hoppers and dumps them into the mixer drum. The inclined track is really a part of the locomotive unit, and its upper end merely slides on a steel platform over the mixer. A king bolt connects the track to the frame of the locomotive unit, leaving it free to swing horizontally. The top of the track is tied back to the bins by cables



THE CAR is hoisted up an inclined track to dump its 10-bag batch into the mixer. The frame supporting the track is connected like a boom to the portable bin unit.

running through sheaves, and the load of the track is kept off the mixer unit by means of counterweights on the cables. This rigging resembles closely the cable connections used on a shovel boom. The car is raised by a drum driven from the power take-off of the tractor.

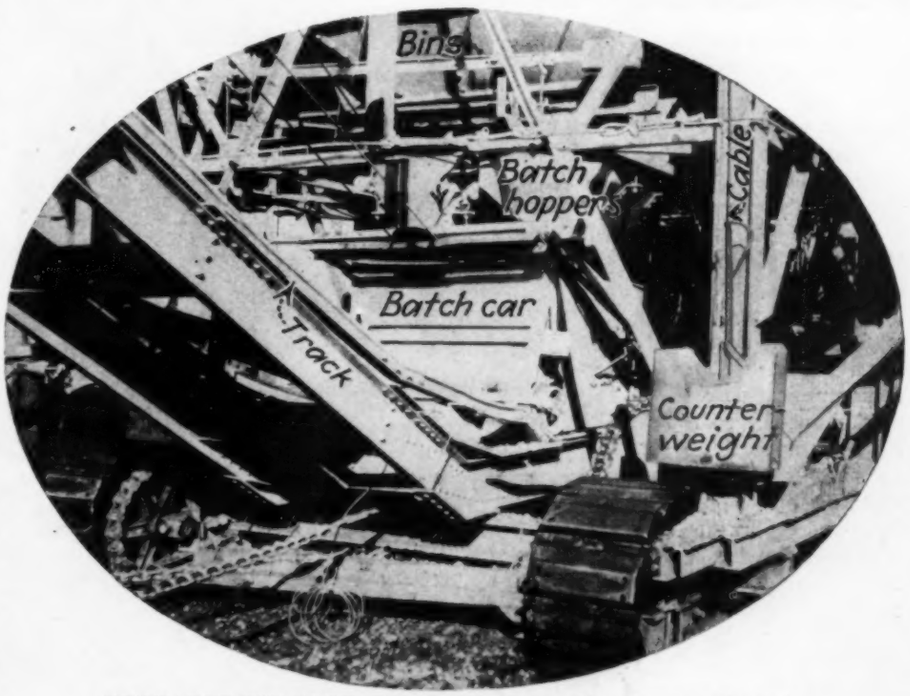
The outfit was assembled in the contractor's shop. A number of standard products are incorporated in the plant. All the units are mounted on Northwest crawlers. The crane is a Northwest gasoline machine with a 40-ft. boom. Aggregates are stored in Butler bins and measured in Butler hoppers. A McCormick-Deering 10-20 tractor moves the train and hoists the batch car. The mixer, a Koehring 10-bag machine, was built especially for this plant. All accessory equipment, such as the track and batch car, was made in the construction company's shop.

Sand and gravel are delivered by industrial railway to the paving outfit in 2½-yd. boxes. Cement is transported from the materials yard on platforms holding 90 bags. Both volume and weight metering devices are provided on the hoppers. In compliance with Michigan's 1928 specifications all batches were weighed on this work. Mixer and car held a 10-bag batch of the 1:2:3½ mix. Two cement hoppers had a capacity of 10 bags each, but the sand and gravel hoppers contained only enough material for a 5-bag batch. These hoppers were filled and discharged twice and the cement was sandwiched between the two layers of aggregate.

Grading Equipment—Two crawler-mounted steel wagons of unusually large capacity were tested on this job. They hauled the sandy loam excavated by one of the two Osgood shovels used on the rough grading. These wagons, designed and built by A. Streich & Brother at Oshkosh, Wis., have a water-level capacity of 12½ cu.yd., but they carry about 18 cu.yd. of earth. Mounted on four crawlers and divided into two compartments with separate dumping gates, they operated easily and proved very satisfactory.

The slab was 20 ft. x 7 in., with the edge thickened to 9 in. and a surface slot along the center line. It was opened to traffic when beam tests gave a modulus of rupture of 500 lb. per square inch.

Operations were directed by B. C. Ziegler, superintendent of construction for the State Highway Department, acting under G. C. Dillman, chief engineer. M. C. Hengst was project engineer. G. P. Scharl, president, supervised activities for the Scharl Construction Company.



PORTABLE BIN UNIT. A tractor motor on this unit moves the train of machines. The batch car is charged beneath the hoppers. Counterweight helps to counterbalance upper end of frame carrying inclined track.

"TURNOVER" TREATMENT
for Oiled Roads

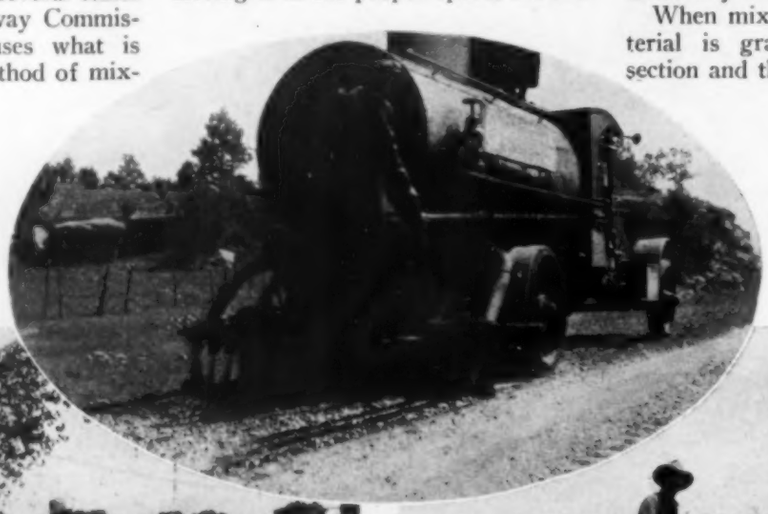
MIXING of road oils with gravel or crushed rock on the surface of the highway has been the subject of experiment in several states (see p. 66). The Highway Commission of New Mexico uses what is called the "turn-over" method of mixing with the use of a one-man grader.

Previous to the oiling operation, the road is built up to required cross-section with gravel or crushed rock and is left to be compacted by traffic. When ready for oiling, the gravel is scarified to a depth of 3 in., and oil is applied by a pressure distributor in two or three applications. Usually about 1½ gal. to a sq.yd. is applied. After each application the loose material on the surface is mixed by means of a disk harrow which makes several trips over the road.

Following the oiling operation, the material is thoroughly mixed by the "turn-over" method. A power grader casts the material into windrows and then flattens them out. By setting the curved blade of the grader at an angle and driving it at the proper speed, the material is rolled over rather than pushed ahead. The grader continues to turn over the mixture until the material is uniformly mixed.

When mixing is completed, the material is graded to specified cross-section and the surface is kept smooth by a light grader until it has been compacted by traffic.

The photographs reproduced here were provided through the courtesy of R. W. Bennett, office engineer, New Mexico State Highway Department.



OIL (*right*) is applied in several applications by a pressure distributor.

BLADING of the mixed material is continued until the road is compacted by traffic.

HARROWING follows each application of oil.

MIXING OPERATION (*left*) on a New Mexico project:—"the roll laid over" by the blade.

MIXING oiled material with a tractor grader

SAFETY

What are you doing on your work to prevent accidents?

The Editor of *Construction Methods* wants photographs illustrating *practical applications* of safety principles on construction.

Not posters, not slogans, but pictures of how machines or methods are being made safe for the man on the job.

THE LOADER TAKES A RIDE *on a Road Job*

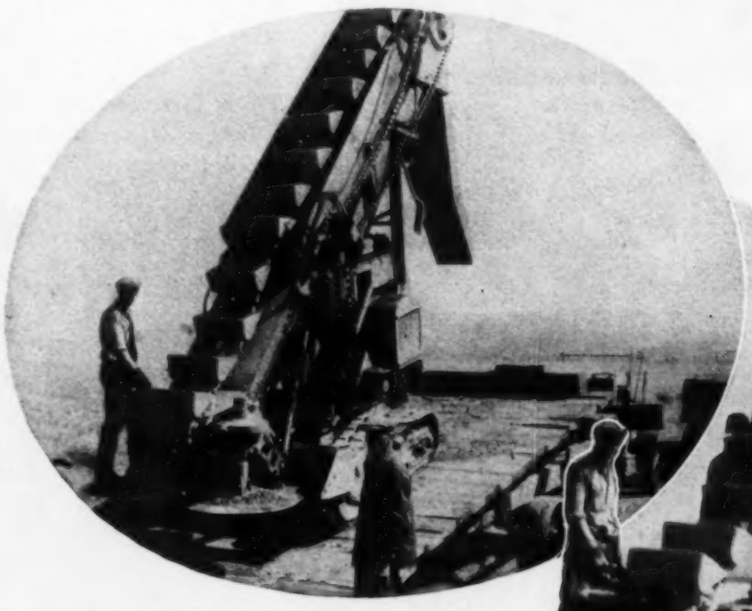
Photographs from
F. E. WILDER
FORBES & WILDER,
Ellensburg, Wash.

"BUSINESS" END of the moving rig. The platform is balanced so that the rear end can be lowered to the ground.

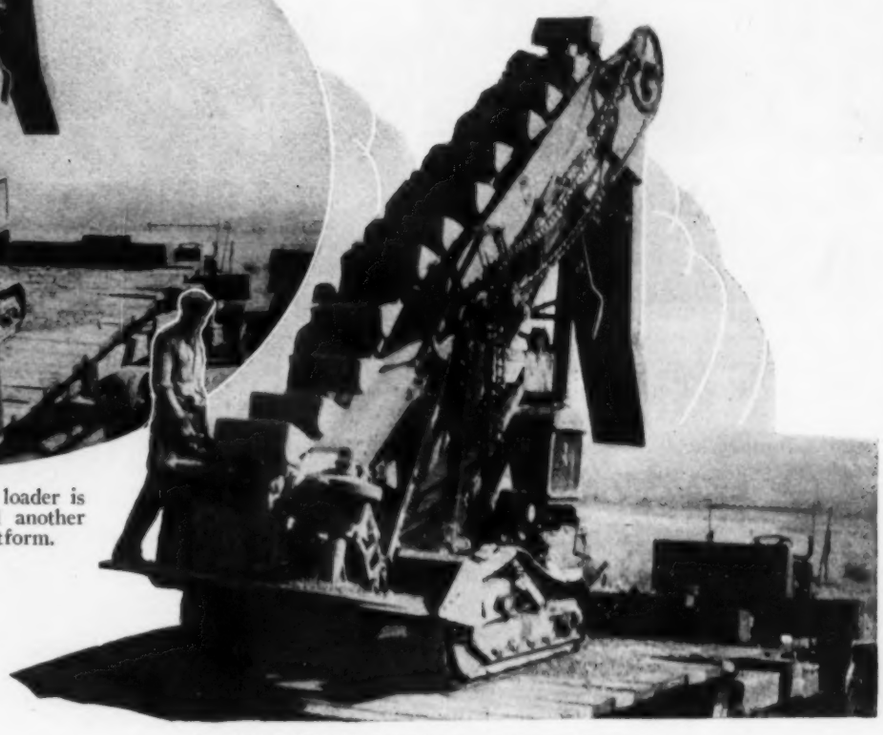
READY TO LOAD. The weight of two men is sufficient to unbalance the platform and lower it to the ground.

GIVING the loader a ride every time it was necessary to move it enabled Forbes & Wilder, paving contractors of Ellensburg, Wash., to save a great amount of time on their road oiling job in Kittitas County, Wash. The road was oiled with 95 per cent asphalt content oil applied to a coat of crushed gravel, approximately 175 cu.yd. of rock per mile of finished roadway being used.

The rock on the job was hauled from stock piles located one to two miles apart alongside the road. A Barber-Greene loader was used to load the trucks, and frequent moves of the loader were necessary. The rig illustrated in the photographs enabled the contractors to move the loader the distance between stock piles, and only 15 min. elapsed between the last truck load at the old set-up and the first truck load at the new one.



HALF WAY ON. The loader is just on the "hump" and another foot will level the platform.



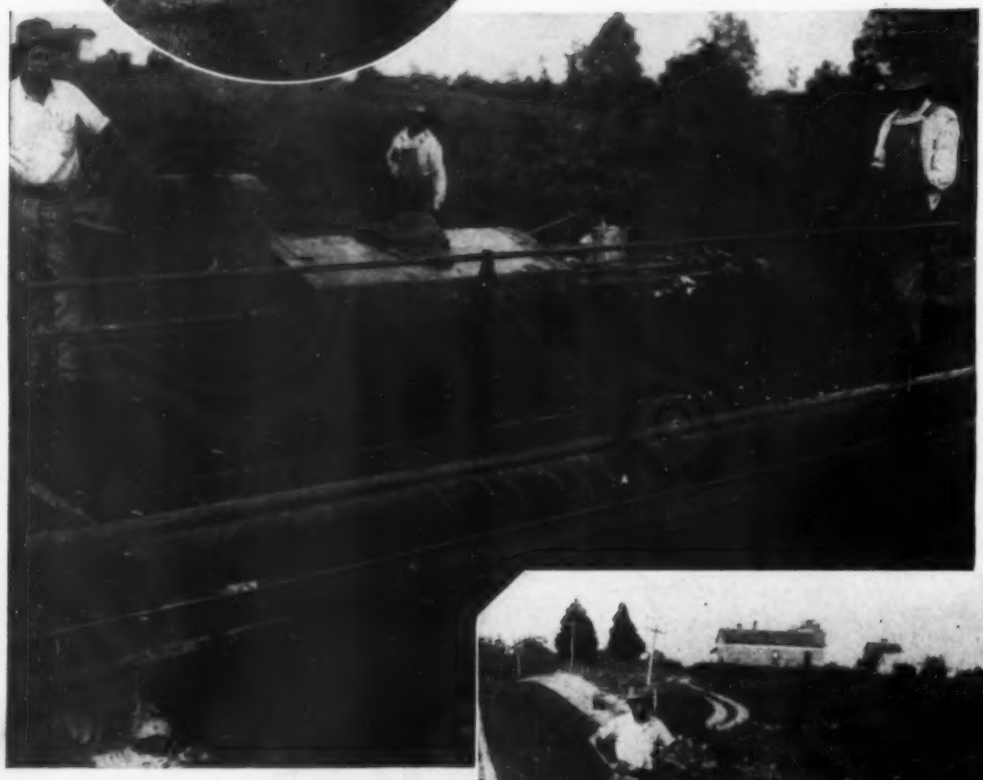
ON BOARD. Ready to go down the road.

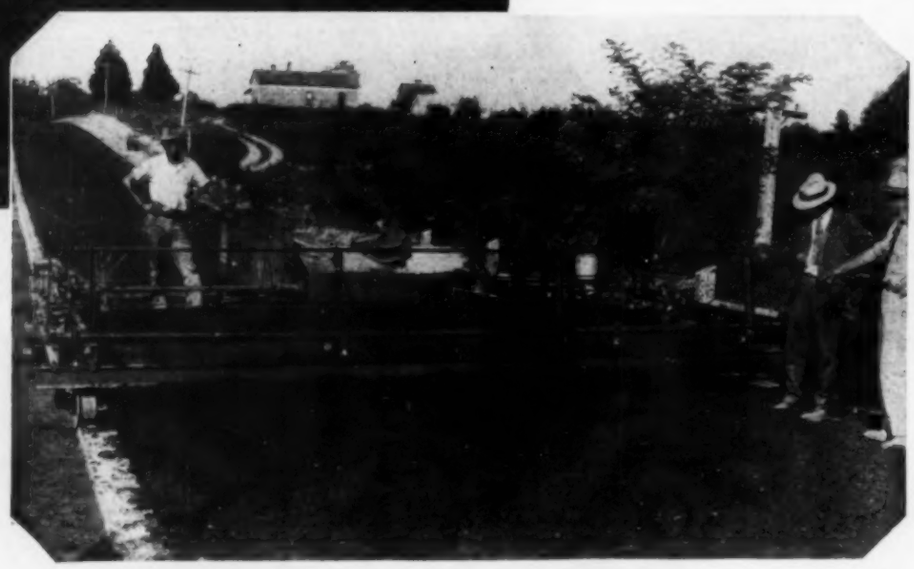
NEXT MONTH. The James River Bridges, three newly completed concrete pile trestle structures on Atlantic Coastal Highway in Virginia, having a combined length of 194,000 lin.ft.—a Turner Construction Company job.

Machines Spread *Cold—in Tennessee*

JOE HUMBARD (*left*) and TOM PETERS were in active charge of the work for the contractor.

RAKING DEVICE (*below*) consisted of shaft fitted with teeth and rotated by sprocket and chain from finishing machine.





STANDARD FINISHING MACHINE, with added raking device, was used to spread cold rock asphalt. T. E. Kaveny, resident engineer for the State, behind the machine.

A CONCRETE finishing machine was used for the first time to spread Kentucky rock asphalt laid cold on a 9-mile paving contract of the John Humbard Construction Company, Knoxville, in Cheatham County, Tenn. A raking device, connected to the standard Ord finishing machine, broke up the lumps ahead of the screed. The rock asphalt was spread and rolled in a 1¼-in. layer on a 7-5-7 (parabolic curve) concrete base with a 1¼x6-in. curb along each edge. The cold material was dumped on the base and was scattered by laborers in front of the rake.

The raking device was mounted on a separate carriage. It consisted of a shaft rotated by sprocket and chain from the finishing machine at a relatively high speed. Teeth were set in spirals along and around the shaft and were arranged to reach every portion of the material. Both finishing machine and rake ran on the curb. The shoes of the screed were adjusted to strike off the raked material ½ in. high.

Advantages accruing from this mechanical method of spreading cold rock asphalt were: uniform distribution (the yield varied less than 0.1 sq.yd. per ton); less supervision required; reduction in labor cost (only nine laborers in the crew); and speed (an average of 3,000 sq.yd. a day).

The pavement was built by Joe Humbard and Tom Peters under the supervision of T. E. Kaveny, resident engineer for the state highway department.

* * *

Slightly different tools were used to gain the same results by the Western Paving Company, Oklahoma City, Okla. This company placed a 2-in. rock asphalt top on a concrete base in Grady County, Okla. The material was dumped on the base at a temperature of 250 to 350 deg. F.

A Koehring road planer replaced hand shoveling as a means of distributing the material in front of the finishing machine. The planer effected a labor saving of 50 per cent. It was adjusted to leave enough material to form a roll in front of the screed.

A rake consisting of ⅜-in. round steel teeth set 3 in. apart in a 2-in.

Rock Asphalt
Hot—in Oklahoma

SMALL TRACTOR pulled the road planer which spread the piles of hot rock asphalt.

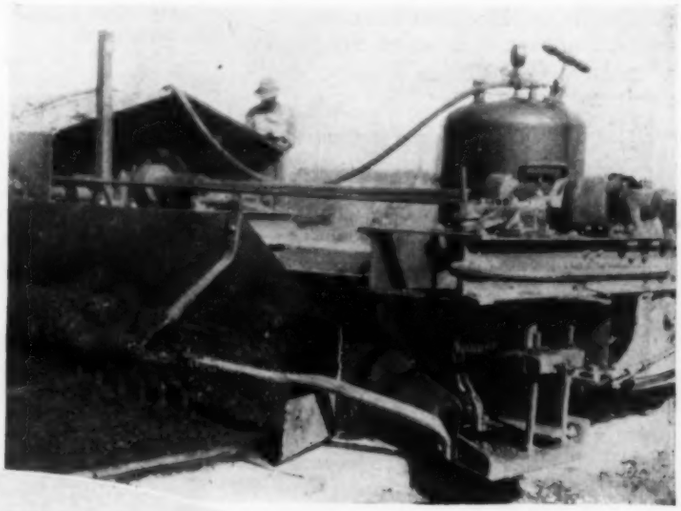
ROAD PLANER, with front row of teeth removed, distributed material to proper depth ahead of finishing machine.

strip of iron was attached to the front screed of an Ord finishing machine. The teeth were placed 12 in. ahead of the screed. They penetrated to the full depth of the material. The rake, making 118 strokes a minute, combed every part of the rock asphalt. The back screed was not used.

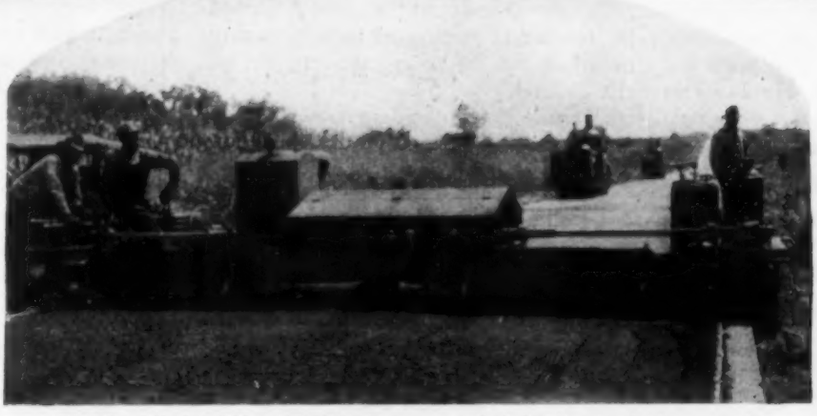
To allow for compression by the roller, the material was struck off ½ in. above the top of the curb. Strips of iron, ½x1½ in., were laid on the curb and were held in place by ⅛-in. iron brackets hooked over the curb. The screed worked on these iron strips.

The machines enabled the contractor to spread 300 tons of material a day. O. A. Bridgeman superintended the work under the supervision of George L. Dolph, resident engineer. State Highway Engineer Clark R. Mandigo was in general charge.

IRON STRIP (*above*) was laid on curb to keep screed ½ in. high.



RAKE (*above*) was attached to front screed and moved with it.



ROLL OF ROCK ASPHALT was carried in front of the screed. Planer left enough material to form this roll.

NEW EQUIPMENT ON THE JOB

Automatic Signal Light

An automatic warning signal, known as the Eveready portable flasher, is announced by the National Carbon

Company, New York City. The unit, fully equipped with batteries, weighs 16 lb. One set of batteries gives two months continuous operation. The flasher requires no attention in the meantime. It is completely waterproof and can be protected from theft.

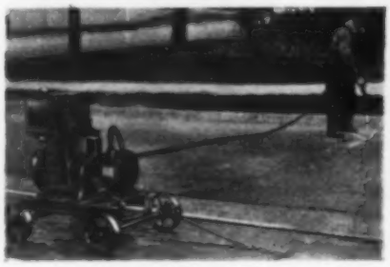
Four-Wheel Drive Grader

A four-wheel drive tractor, with the rear axle connected to pivot on the grader frame, has been introduced by the Austin-Western Road Machinery Company, Chicago, in its new dual-

drive motor grader. Weight which in older models was distributed between the front wheels of the grader and the two drive wheels of the motor unit is now concentrated on the four drive wheels of the tractor, giving the double advantage of greater traction with reduced pressure per drive wheel. The pivot connection allows the front end of the tractor to move up and down inside the grader frame.

For Pavement Maintenance

A small one-man portable blower outfit for cleaning cracks in pavement preliminary to filling has been placed



on the market by the Novo Engine Company, of Lansing, Mich. The outfit consists of a 2-hp. single-cylinder Novo engine connected to a Connersville blower discharging 35 cu.ft. of air per minute. An ordinary garden nozzle at the end of the hose regulates the pressure.

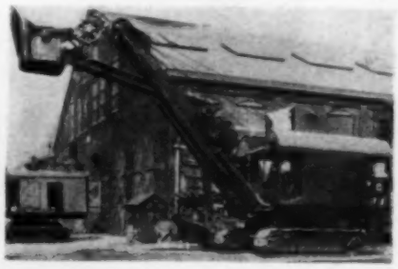
Scarifier Attachment

A scarifier which can be attached to the drag frame behind the front wheels of any of their latest one-man automatic road maintainer models has been announced by the Baker Manu-

facturing Company of Springfield, Ill. The scarifier, which carries fourteen manganese steel teeth, can be adjusted by cranks at each end to cut to any depth or can be raised entirely out of the ground.

A New 2-Yd. Shovel

Steam, electric, or Diesel-electric power may be obtained in the new type 2-yd. shovel manufactured by the



Marion Steam Shovel Company, Marion, Ohio. In the Diesel-electric model, a 150-hp. six-cylinder engine is direct connected to a d.c. generator supplying power for electric motors geared individually to hoist, swing, and crowd.

Bucket Line Excavator

A crawler-mounted excavator carrying four vertical booms (similar to the boom on the Barber-Greene ditcher)

in front of the chassis is to be exhibited at the Road Show by the Barber-Greene Company of Aurora, Ill. The booms are in two independently controlled units of two bucket lines. They make a cut 8 ft. 5 in. wide and can be adjusted for accurate grading to a depth of from 1 in. to 7 ft.

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THEW CENTER DRIVE

T H E W

1929 CONVENTION AND ROAD SHOW JANUARY 14 TO 18 INCLUSIVE CLEVELAND OHIO
AMERICAN ROAD BUILDERS' ASSOCIATION

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Lorain Center Drive Thew Machines have successively made available—

1. A Center Drive, 2-speed, continuous tread truck that is manoeuvred with unsurpassed ease and, on the average, costs less than $30 per year to maintain.
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3. A Center Drive Shovel Boom that, for its length, gives greater working ranges than any other boom in the world.
4. A 2-Sheave Dragline Fairlead that gives many times the ordinary cable service.
5. A Backdigger with a tilting bucket under absolute control of the operator, which accomplishes five important operations impossible with any other type and never before available.

In these Thew has provided a smooth, positive, three-lever control to single motor operation never equalled even in steam-operated machines.

Over and above these major developments a special engineering department devoting its entire time to the work has made more than 200 improvements in detail in Lorain machines. Except in a very few instances these are applicable to all machines now in service.

Thew machines are built in a plant equipped for modern precision work and mass production. Methods used by the most successful and advanced automobile companies have been adapted to our needs and have contributed greatly to Lorain success.

Because Lorain machines are based on sound engineering principles and definitely designed to stand up under the most severe service, they have gone into the heaviest of contracting and railroad jobs and into quarries and have performed, efficiently and without strain, work previously assigned to much larger machines.

EACH January, at the Road Show, Thew offers for inspection its newest product or improvement. 1929 will be no exception to the rule.

At our exhibition space in Cleveland, January 14 to 18, the latest Thew development — *not yet announced* — will be on display for the first time. You will find it a sound, substantial, worth-while contribution to American industry.

THE THEW SHOVEL CO.
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President

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. . . start the job

SCOOPS
. . . move the dirt

CRAWLERS
. . . increase traction

ROLLERS
. . . finish the work

SNOW PLOWS
. . . keep traffic moving

Your name on a postcard reserves a copy of our new 1929 catalog . . .

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easily . . . quickly . . . efficiently.

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A new Rear Crawler

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. . . the 1929 model . . . simplified . . . greater wearing surface . . . lower in price . . . increases the tractive power of any tractor fifty percent.

See them at the Road Show—Booth WW-99

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NOW The LEACH 5S

Speed
All-Steel
Capacity
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THE little *Hustler*—the quick-acting Leach 5-S. It is uncanny when it comes to mixing a batch—doing it thoroughly and discharging it *clean*. It clips off *seconds*, which mean *extra yardage* to you.

And it has the *stuff*—all-steel construction to give it longer life—clean-charging skip—speed in handling—ample power.

Include a Leach 5-S in your fleet—others are doing it and it pays them well.

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Kindly send us complete information covering your 5-S Mixer.

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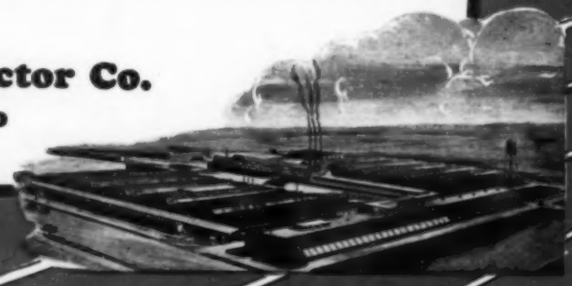
"Show Week"

ON Monday, January 14th, the curtain will rise on the greatest exposition of highway and contractor equipment ever staged. In Cleveland's beautiful and spacious Public Hall the annual Road Show and Convention will be inaugurated with the enthusiasm which only a national meeting of men representing such a great industry can generate. During five big days, education and entertainment — fun and friendly association—will be dealt out in generous portions. A wonderful time is guaranteed to all who come.

Cleveland is the home of Cletrac Crawler Tractors — and again this year the Cletrac organization will keep "open house" for all who attend the Road Show. Special entertainment will be provided at the factory — special demonstrations of special equipment will be made — special features of many kinds are scheduled for you.

See the big show and the Cletrac exhibit at the Auditorium by all means — but *don't fail to visit the Cletrac factory* where big preparations have been made for your visit. Free bus service to and from the factory — free buffet luncheon all day long, every day.

The Cleveland Tractor Co.
Cleveland, Ohio



Cletrac

in Cleveland

Cletracs famous five models cover the entire range of power needs in highway and general contracting service. From 12 h. p. to 100 h. p., they offer a complete choice of tractor sizes and ratings. See them at the Road Show and at the Cletrac factory — January 14th to 18th.

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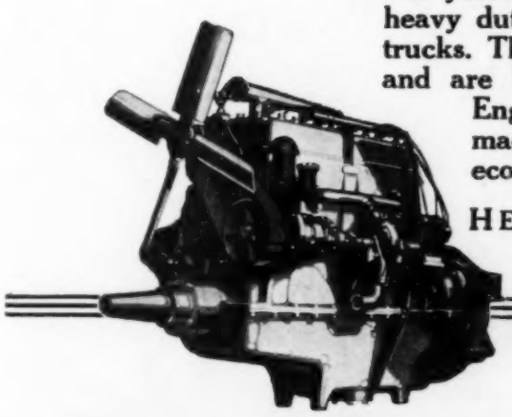
Pathways to New Prosperity . .

CUT through the hillsides, filled in across the lowlands, hewn through cliffs of solid rock, more than half a million miles of improved highways link the cities, towns and hamlets of our nation.

But the task is just begun. Highway building—forerunner of a new prosperity—continues. Thanks to specialized road building machinery, the development of our highway systems is steady and sure.

Hercules will exhibit in Space AA1 at the A. R. B. A. Road Show

For years Hercules has made a business of supplying heavy duty power for road constructing machinery and trucks. Thousands of miles of highways have been built, and are being maintained, with the aid of Hercules Engines. Hercules Power Units for road building machines of all types are sturdy, reliable and economical workers.



HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.

HERCULES ENGINES

Now A Super IRON MULE

4 GOOD YARDS A LOAD

4 yards with crowned load, that's the capacity of the new Hughes-Keenan "Iron Mule."

This giant dirt mover will keep the big shovels plunging and snooting—digging deep every time to give it a full capacity load.

Not only will this super "Iron Mule" make shovels pay bigger profits but its speed, power, strength and tenacious traction will produce the phenomenal daily yardages. On short hauls nothing—not even trucks can pay you a bigger profit-per-load than the super "Iron Mule."

The "Iron Mule" is a complete dump unit—like a truck—a dump body mounted on the famous 10-20 McCormick-Deering tractor.

HUGHES-KEENAN
SPACE WW 75
(West Wing)
1929 ROAD SHOW

If hundreds of contractors buy and keep on buying "Iron Mules"—if 60% of our present business is filling repeat orders, "Iron Mules" must be worth your consideration for short haul dirt moving. See them in action, we'll tell you where. Better still, let's run one out on your job. Choose a wet day when animals are floundering and trucks skidding and digging themselves in. Watch this sure footed marvel shoot under the shovel — scoot away with a crowned load of 4 yards. Time the trip and figure the cost against animals and trucks and you'll yell for "Iron Mules" like hundreds of other contractors. See "Iron Mules" at Road Show.

THE HUGHES-KEENAN COMPANY, MANSFIELD, OHIO

"IRON MULE"

TRACTOR DUMP

POWERED BY 10-20 McCORMICK-DEERING

Roebling
"BLUE CENTER"
Steel Wire Rope

is an achievement of the highest order. Its performance on all heavy duty operations has proven the above assertion.

Because of its superior quality, "Blue Center" Steel Wire Rope is the most economical rope to buy for severe conditions. It is constructed to withstand sudden shocks; vibration; abrasion and fatigue, and is made in constructions to fit your particular requirements.

JOHN A. ROEBLING'S SONS COMPANY
Trenton, New Jersey

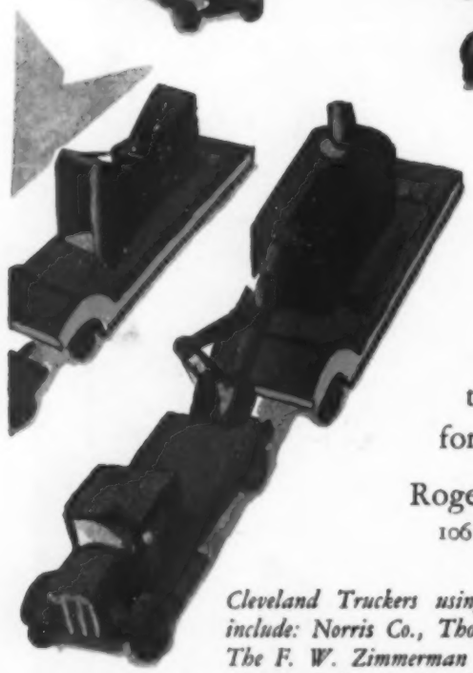
THE ROAD SHOW ON ROGERS TRA

The official mover for the American Road Builders Exposition and the several truckers who will aid in the tremendous task of moving thousands of tons of equipment to and from the Cleveland road show, use Rogers Heavy Duty Trailers almost exclusively.

The position of dominance held by Rogers Trailers in Cleveland also exists or is being rapidily duplicated in many localities throughout the country. As destinctive design, exclusive mechanical advantages and uncommon ruggedness are being recognized, merit is being rewarded.

See various types of these trailers at the Road Show. Visit the Rogers exhibit at booth AY 30, Central Armory. Write for new catalog.

Rogers Brothers Corporation
106 Orchard St., Albion, Penna.



Cleveland Truckers using Rogers Trailers include: Norris Co., Thos. Easton Sons Co., The F. W. Zimmerman Moving Co., The Cleveland Cartage Co., Brown Cartage Co. and Wm. B. Smith.

MOVES
AILERS

1929 ROAD SHOW
A.R.B.A.
CLEVELAND - O.
JAN. 14TH TO 18TH

SPACE
AY-30
CENTRAL
ARMORY

SEE OUR EXHIBIT

ROGERS TRAILERS
GOOSE NECK
HEAVY DUTY

THE 1929 MULTIFOOTE PAVER

will be on exhibition at Booth WW 101 at the Cleveland Road Show. It will be essentially the tried and tested paver which has three seasons of record performance to its credit. But, in addition, the 1929 MultiFoote will be even faster than ever. The changes which have been made give considerably added speed of operation as well as traction. A heavier, stronger frame has been adopted, the boom drive has been simplified, the water measuring device improved, the hoisting and charging and discharging operations considerably speeded up. Every feature of automatic operation which has been proven practical is now on the new 1929 MultiFoote.

Don't fail to see it at the Show.

THE FOOTE COMPANY, Inc.
of Nunda, New York

WORLD'S LARGEST EXCLUSIVE BUILDERS OF ROAD PAVERS

Frank E. Hall
152 W. 42nd Street New York City

E. J. McHarg & Company
31 Crestmont Rd. Binghamton, N. Y.

Wilcox Brothers
588 Chenango St. Binghamton, N. Y.

Burton Franklin
Volunteer Bldg. Chattanooga, Tenn.

Edward R. Bacon Company
Folsom at 17th St. San Francisco, Calif.

MultiFoote Sales Company
2811 West Fulton Street Chicago, Ill.

CM1-Gray

Lehigh Cement on a High-Early-Strength Job!

A STORY TOLD IN PICTURE FORM

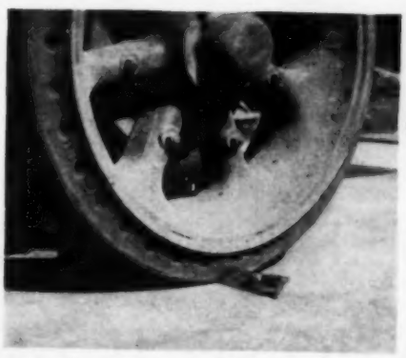
Scene: A busy street in Allentown, Pa.

9.15 a.m., Sept. 8, '28

Contractor began placing concrete made with Lehigh Portland Cement. This section completed 5 p.m., same day.

18 hours later

A truck and load weighing 14 tons is driven on the concrete without damaging it.



To make the test as severe as possible the rear wheel of the truck was run over an angle iron.

5 p.m., Sept. 10, '28

48 hours after completing the placing of concrete—The new paving is opened to regular traffic.

LEHIGH CEMENT

Lehigh Portland Cement Co.

Young Bldg., Allentown, Pa. Conway Bldg., Chicago, Ill. *Offices in Principal Cities.*

No expensive materials are needed for high-early-strength concrete. This FREE new bulletin tells why. Send for it. Write or fill out the coupon.

Free—an important new bulletin

"High-Early-Strength Concrete with Lehigh Cement." Please mail the coupon or write to Lehigh Portland Cement Co., Box 9-A, Allentown, Pa., or Chicago, Ill.

Name_____

Firm_____

Street & No._____

City_____

State_____

ANNOUNCING

THE

AMES ROAD ROLLER

MANY NEW AND USEFUL FEATURES

ON EXHIBIT
AT
CLEVELAND ROAD SHOW
Jan. 14 to 18, 1929
SOUTH EXHIBITION HALL

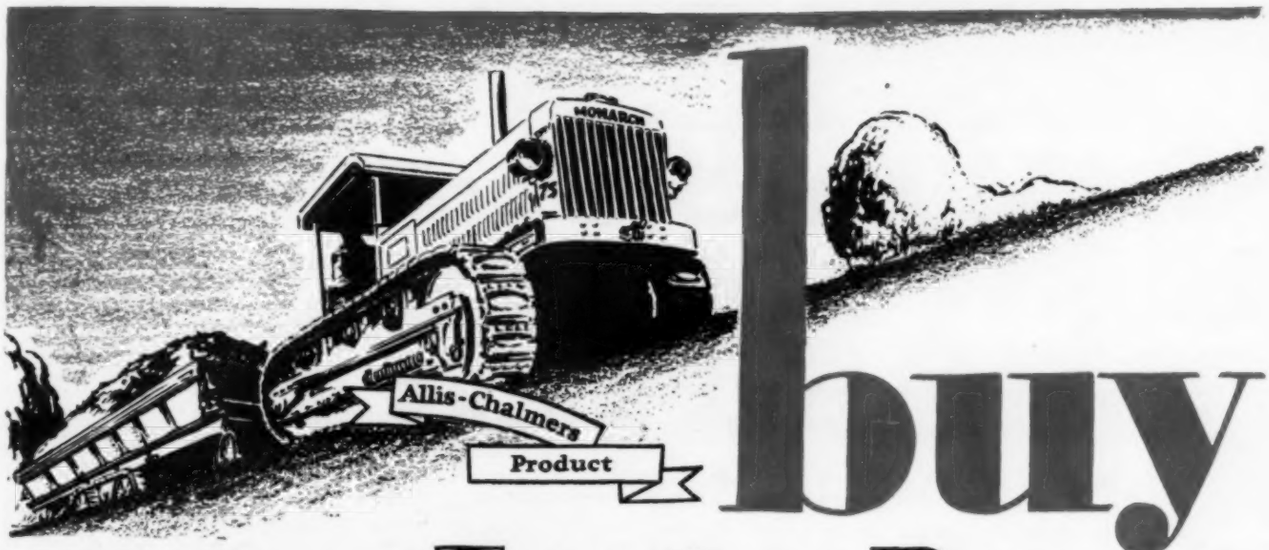
THE MOTOR ROLLER YOU HAVE BEEN WAITING FOR

OUR 75th ANNIVERSARY

DIAMOND JUBILEE

1854-1929

AMES IRON WORKS
DIVISION OF PIERCE, BUTLER & PIERCE MFG. CORP.
OSWEGO, N. Y.



buy

. . your Tractor Power *where Industry buys power machinery* . . . . . .

FOR eighty-one years industry has looked to Allis-Chalmers for leadership in the development of power machinery. In every quarter of the world its products are supplying towns, cities and communities with light, heat, water and power.

Everywhere the result of Allis-Chalmers mechanical advancement is known and vitally present, reducing costs for manufacturer and consumer, opening the way for greater conveniences and providing a measure of public service never before possible.

It is inevitable that the vast facilities and resources of Allis-Chalmers should be turned to the development of economical tractor power in the now nationally acclaimed Monarch "50" and "75" Tractors. You can buy in the Monarch, power for every tractor need. For hard jobs on the farm, road building, construction, pulling, threshing, driving—the Allis-Chalmers-Monarch is without equal in power or performance.

It does these jobs economically by providing the lowest priced drawbar horse power of any tractor on the market. You can do better if you buy your tractor where industry buys its power machinery—from Allis-Chalmers-Monarch.

Seventy-five - $5350.00
Fifty - - - - - - - 3625.00
F. O. B. Springfield, Illinois

Send for details.

MONARCH TRACTORS CORPORATION
Subsidiary of Allis-Chalmers Mfg. Co.
SPRINGFIELD, ILLINOIS

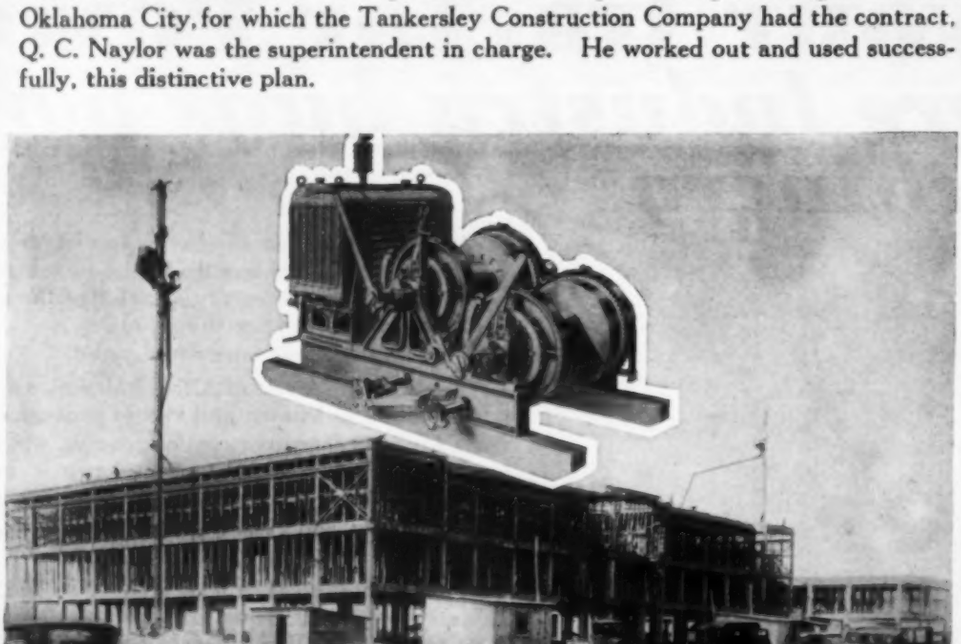
Monarch Tractors

See our Exhibit at the 1929 A. R. B. A. Convention and Road Show — Cleveland, January 14 to 18.

CLYDE

HOISTS CLYDE DERRICKS

The illustration shows an unusual construction set-up. A Clyde two-drum gas hoist located in the center of the building handled both of the Insley mast plants, one located at each end. The job is the new Capital Hill Junior high school at Oklahoma City, for which the Tankersley Construction Company had the contract, Q. C. Naylor was the superintendent in charge. He worked out and used successfully, this distinctive plan.



CLYDE IRON WORKS SALES CO.

DISTRIBUTORS FOR CLYDE IRON WORKS DULUTH, MINNESOTA

—BRANCHES—

NEW ORLEANS: 309 MAGAZINE ST.
PORTLAND, OREGON: 555 THURMAN ST.
SEATTLE: 3410 FIRST AVENUE SOUTH
CHICAGO: 11 SO. LASALLE STREET
MEMPHIS: 69 UNION AVENUE
NEW YORK: 856 EAST 136TH STREET
VANCOUVER, - - - BRITISH COLUMBIA
1325 STANDARD BANK BLDG.

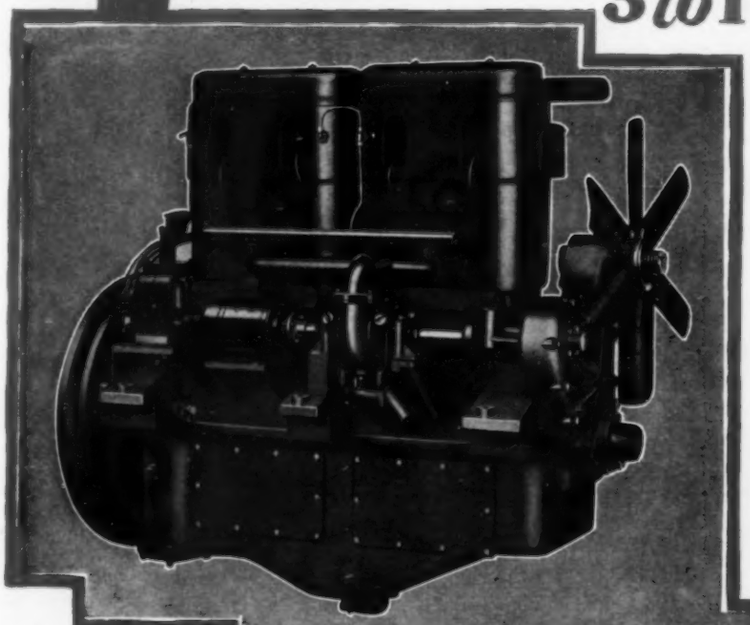
CLYDE TWO MARKS OF GUARANTEED QUALITY

SUCCESSFUL PERFORMANCE FOR A.G.C.

YOUR... OPERATING COSTS ARE LOWER WITH...

LE ROI ENGINES

3 *to* 170 HORSE POWER



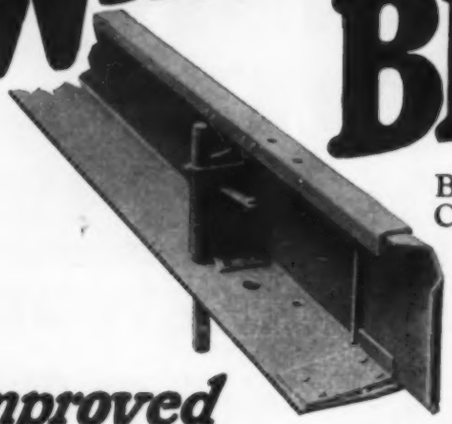
SIMPLY because the Le Roi Engine gives *dependable power, consistently* — it holds down operating costs. Those idle hours which cost so terrifically are turned into profitable production.

Le Roi's claim to this high and enviable position is an earned one. It is entirely due to unparalleled performance—lower maintenance costs — longer life — in short, the lowest operating costs per day and per year.

Le Roi's the Power!

LE ROI COMPANY · MILWAUKEE, WIS.

What's new at BLAW-KNOX?

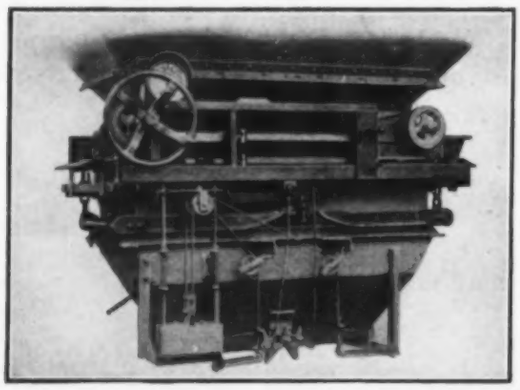


Blaw-Knox Company's big exhibit at the Cleveland Road Show is on the main floor of the Arena . . . at the entrance.

You will see

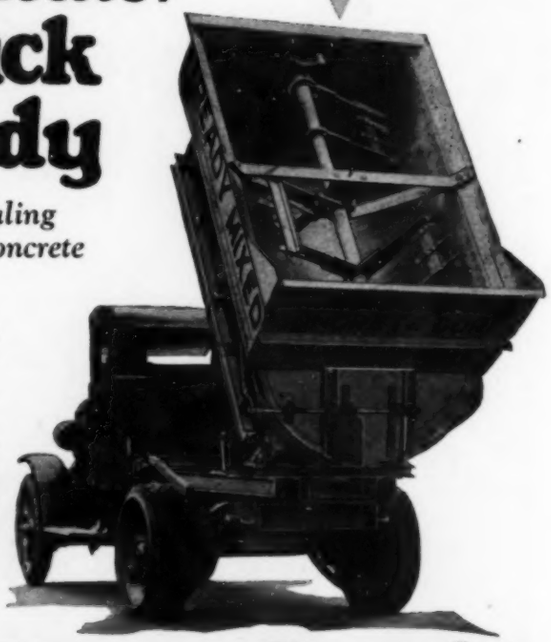
Improved **Road Forms**

— faster **Weighing Batchers**



and the **Agitator Truck Body**

for hauling Mixed Concrete



. . . also the complete line of Blaw-Knox ROAD BUILDING EQUIPMENT including—

Portable, self-cleaning Steel Bins · BATCHERPLANTS · Central Mixing Plants · Ready Mixed Concrete Plants · Steel Forms for Curb, Curb and Gutter and Sidewalks · Volume Batchers · Cement Weighing Batchers · A Triplex Gate for Three-Compartment Bins · The Blaw-Knox Inundator · Blaw-Knox Clamshell Buckets · Blaw-Knox Dragline Buckets · Blaw-Knox Floorgard Steel · Blaw-Knox Electro-forged Steel Grating.

BLAW-KNOX

BLAW-KNOX

For good roads at the lowest possible cost!

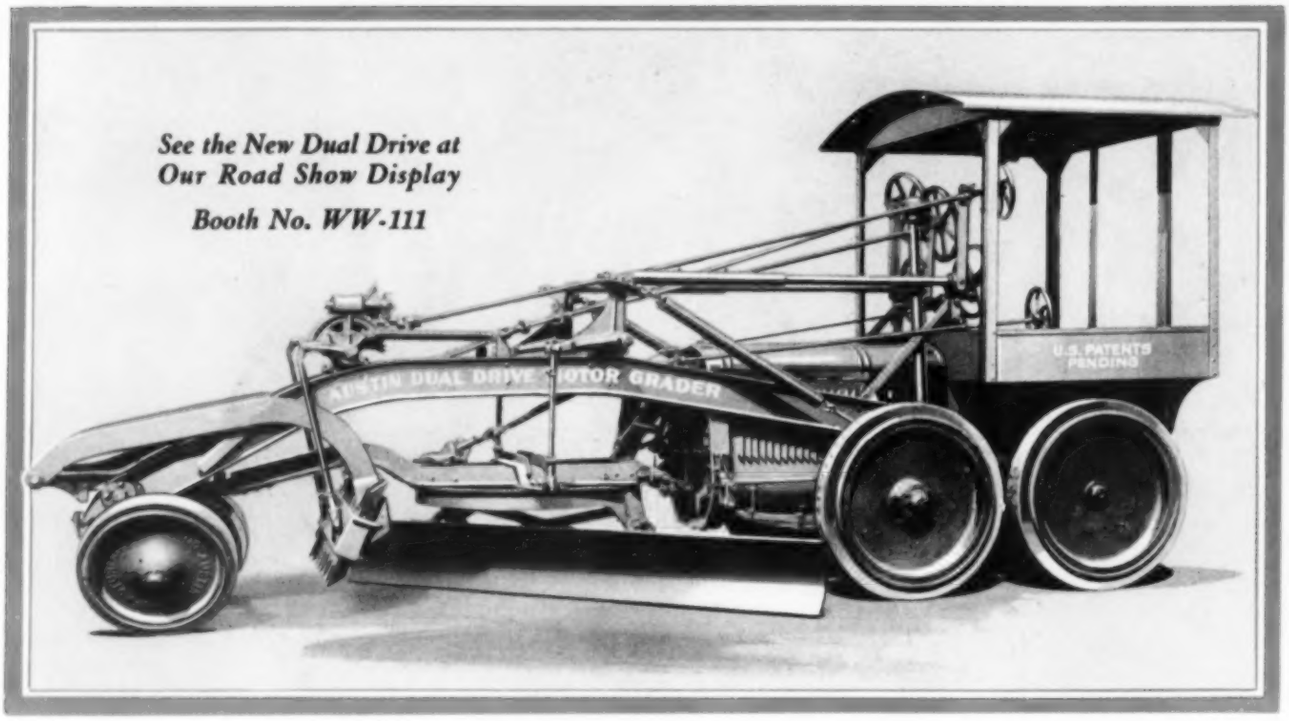
Just as in 1858 the first Austin scraper was built to simplify road building, so today the entire Austin-Western line of road machinery is designed and built that good roads can be *kept* good at *the lowest possible cost!*

New machines, new improvements, labor-saving devices—all these are found in the 1929 line of Austin-Western Road Machinery.

Improved machinery brings improved methods and lowers costs by doing more work with less labor and in a shorter time. Austin-Western Road Machinery *costs less* because it gives *most miles for your road dollars.*

Austin-Western
ROAD MACHINERY

"Most miles for your road dollars"



The New Austin Dual Drive— the latest development in road machinery

Increased traction from four drive wheels . . . full utilization of power . . . freedom from friction or other power losses . . . freedom from skidding or miring . . . self-adjusting to level of even the roughest ground by means of the "floating" power unit . . . by these features Austin Dual Drive Motor Graders assure you of "Most Miles for Your Road Dollars"

Four great drive wheels, carrying the tractor as a separate or "floating" unit, give twice the normal driving contact with the ground and actually use all of the power that 10-20 or 15-30 McCormick-Deering tractors can deliver.

Tests have shown that the engine will kill itself before the wheels will slip. This extra margin of power and traction is attained *at no increase in operating costs!*

Even though the total weight of the Dual Drive is greater, there is less down pressure per wheel because the weight is evenly distributed over four points. For this reason, and because the rear drive wheels follow directly in the tracks already made by the forward drive wheels, Austin Dual Drive Motor Graders will work over softer and wetter ground without skidding or miring down than has ever before been practical. These machines can start to work earlier in the spring and can get out on the road right after a storm!

As the only connection between the grader and the "floating" power unit is through the rear axle of the tractor—motion from the unevenness of the ground is not transmitted to the grader, but is taken up by the front end of the tractor which is free to rise and fall on the forward drive wheels.

Other time-tested features

Ball and socket joints—overhanging bearings in the raising arms—cast steel circle and positive locking device—all these have been used on the Dual Drive just as they have been on other Austin Graders for many years. The regular Austin steering mechanism for either straight or leaning front wheels or an automotive type of steering can be supplied as preferred.

A new lifting mechanism with the famous Austin butterfly is used. An enclosed screw operating in Timken bearings takes the place of the old open gear pull rod.

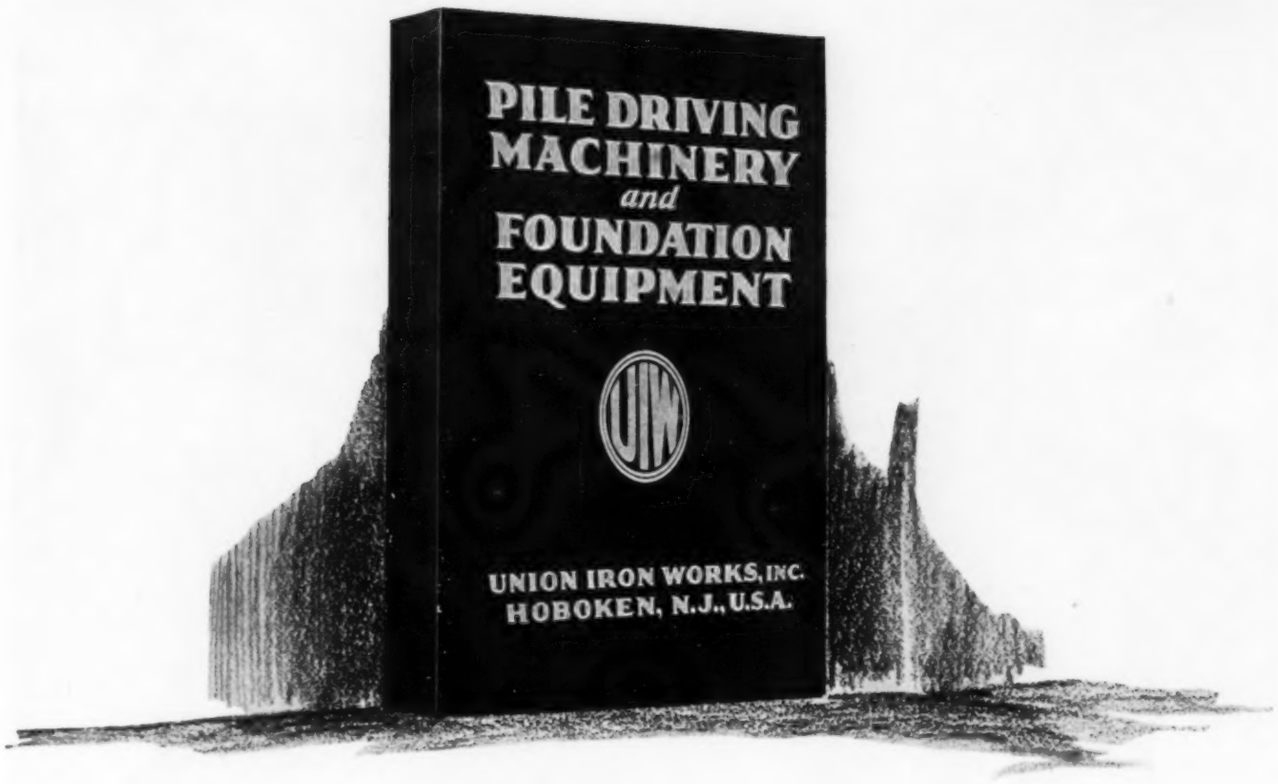
Be sure to postpone buying your new motor grader until you have investigated the New Austin Dual Drive.

Descriptive literature on the New Austin Dual Drive will be sent on request.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue, CHICAGO, ILLINOIS—Branches in principal cities

Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Rollers (Steam and Motor Driven), Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers



Behind the cover you will find

complete information on pile-driving and sub-aqueous foundation equipment and the application of same for both ordinary and extremely difficult conditions. This book not only completely describes and illustrates the Union Line but it also contains information with illustrations, tables, charts, etc., on subjects which have heretofore not been compiled and published under one cover. It also covers the development of pile-driving from medieval times to date, the early use of compressed air for the construction of deep foundations and tunnels and the present methods employed, information on the bearing power of piles, data on the use of the water jet to aid pile-driving, etc., etc.

112 PAGES of helpful data

Engineers, contractors and executives concerned with construction work owe it to themselves to have a copy on hand for ready reference. As we have spared neither trouble nor expense to publish this book, it is essential that we limit its free distribution. Send your request for a copy on your company's letterhead as only requests coming from legitimate sources can be honored.

UNION IRON WORKS, Inc. *Lackawanna Siding* **Hoboken, N. J.**

ASK FOR CATALOG 124 – IT'S NEW

Designed *for the Job*

The economy of adhering to fundamental principles of earth moving is exemplified in Stockland Road machinery. Instead of depending upon brute force and bulk, Stockland machines are designed *for the job*. The result is lighter weight, greater speed, labor economy and more years of efficient service.

Instead of breaking and tearing the soil, Stockland Graders CUT it like a plow. Instead of dragging and pushing by main strength, the Stockland blades LIFT and ROLL the earth—progressing easily and smoothly on the toughest jobs. Such proper handling of the soil requires less power and subjects the machine to a minimum of strain and wear.

In every detail of Stockland construction, intelligent design works betterments and economies. The job is done quicker and at lower cost. The equipment endures strenuous service with least maintenance and repair. All along the line, Stockland design means dollars saved on every road-building job.

See Our Exhibit at the Cleveland Road Show, Jan. 14-18th.

Let us send you complete specifications of the many Stockland models. Unquestionably there is a Stockland Grader that meets your needs, *exactly*

The Stockland Road Machinery Division

of

FOOTE BROS. GEAR & MACHINE CO.

204 N. Curtis St., Chicago

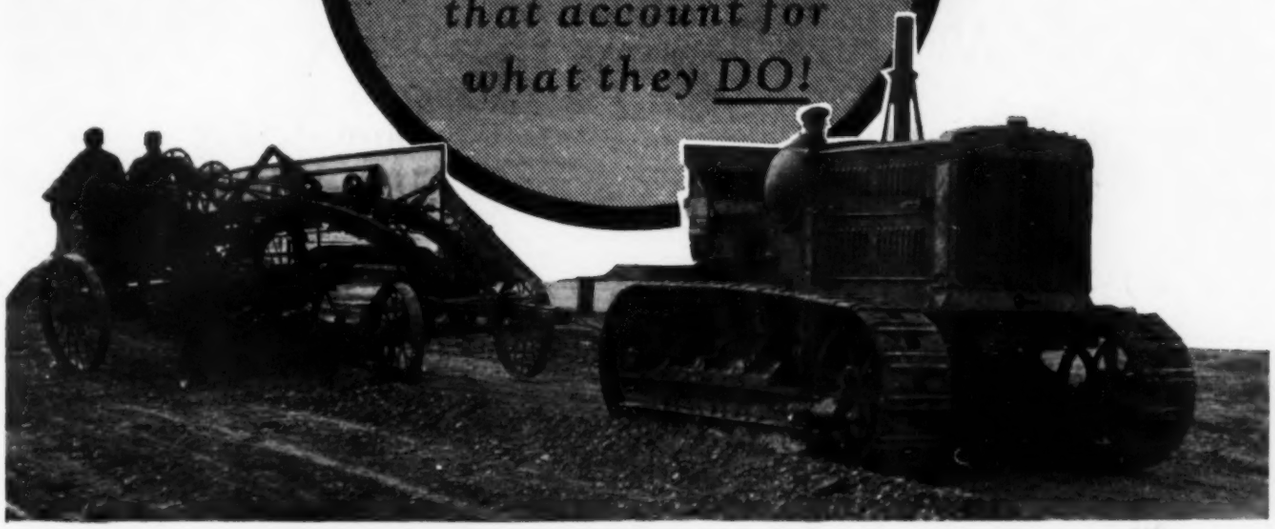
Stockland Graders

Modern Equipment to Modern Methods

It is the design and materials in

BATES TRACTORS

that account for what they DO!



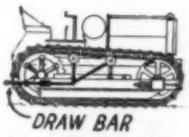
STABLE ON SIDE HILL WORK

It always stays "right side up." Broad and low but with maximum ground clearance.

GOING OVER

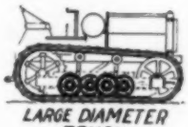
ROUGH SPOTS

In going over these rough spots the twist doesn't hurt because the Bates is built to be flexible.



DRAW BAR

The underslung drawbar pulls down on crawlers and adds to traction.



LARGE DIAMETER TRUCK WHEELS

SEE the Bates at the Road Show! Go over its design and construction part by part! That will reveal why the BATES can give the last full measure of service on the job.

The Bates Tractor has been built out of years of experience by pioneers in this field. It has been tested under every conceivable condition and the praise it has won from users has been the result of sheer "making good."

For instance, the crawlers on all Bates Tractors are of extreme length, making these machines easy to handle under all conditions, able to negotiate soft spots due to the additional amount of traction on the ground.

The underslung swinging drawbar pulls down on the crawlers and adds to traction. Sloughing around on heavy off-side pulls is prevented.

Material of the highest quality, heat treated to give greatest resistance to wear; devices for exclusion of dust; and roomy accessibility—these are other features of Bates design.

Investigate the Bates! Built in three sizes—28—40—70.

THE BATES TRACTOR DIVISION

of

FOOTE BROS. GEAR & MACHINE CO.

205 North Curtis St., Chicago, Ill.

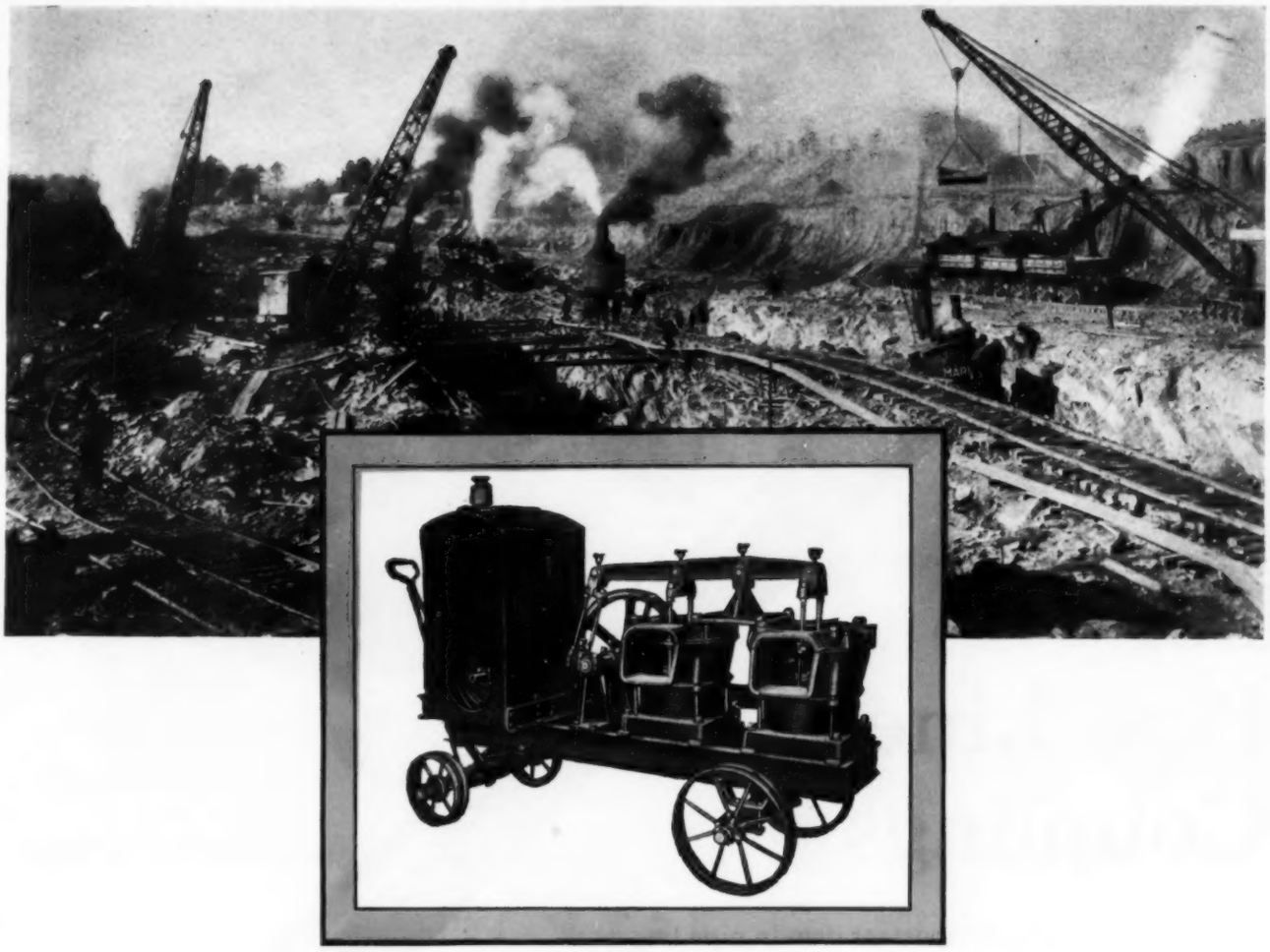
CONTRACTORS

MEET US AT THE ROAD SHOW
AT FOLLOWING EXHIBITS:

Koehring — Blaw-Knox
Insley — Huber
Smith — Parsons
Clyde — Ord
National Compressor

"Doc." Horan
Ken. Byram
Bill Bucher
Paul Walton
Emmett Harrison

R.E.BROOKS CO.
EQUIPMENT for CONTRACTORS
50 CHURCH ST. NEW YORK CITY



For Greater Capacities and Higher Lifts

Distributors:—**See us at our booth EH-51 at the Road Show. Your territory may be open.**

HOUR after hour, without stop or breakdown, Humphryes Double Diaphragm Pumps deliver big volume.

Maintained suction develops higher vacuum, higher suction lifts.

Real tests are made on the job. Humphryes capacity, sturdiness, dependability and accessibility make them favorites with contractors and distributors everywhere.

Let us explain in detail why Humphryes pumps consistently deliver "more gallons per day," and, in so doing, cut pump operation costs to the bone.

There's a Humphryes pump to meet every requirement. Send for bulletins describing the entire Humphryes line.

The Humphryes Manufacturing Co.----Mansfield, Ohio

HUMPHRYES
CONTRACTORS' PUMPS

For Pipe Line Couplings

Speed is often an important item in pipe line work. Taking time out to refit the wrench is costly when compared to the reversible ratchet operation of Lowell Ratchet Wrenches.

Work the Lowell with one hand or both—in places where there is lots of room or in cramped quarters where the back and forth ratchet movement is the thing that makes the job easy. Wherever bolts or screws must be tightened or loosened on construction work Lowell Wrenches save time and money. It's always quicker and easier to *pump* than it is to refit.

We will be glad to send you literature illustrating and describing the complete line of Lowell Reversible Ratchet Wrenches. If requirements call for big special wrenches, Lowell can meet them.

Send for catalog R.

LOWELL
REVERSIBLE
RATCHET
WRENCHES

LOWELL WRENCH COMPANY

WORCESTER, MASS.

The Hoist With The
EXCLUSIVE BRONZE SCREW
PAT'D. APP. FOR

Unit type construction. Add double or triple drum in the field at any time.

SIZES
2 to 50 HP.
Single and Multiple Drum

HUSKY RELIABILITY

A good hoist is about the handiest piece of equipment the contractor has. It's his fundamental power tool—its uses are many and varied.

The better the hoist, the more useful it is—the harder you can work it—the more ways it will work for you.

Seasoned by our 24 years' experience—enriched by the most advanced engineering—built with modern production facilities—of the best materials —BROWN "Giant-Line" HOISTS are a superior product in every way.

Husky reliability is their chief characteristic.—They work for you year in, year out.

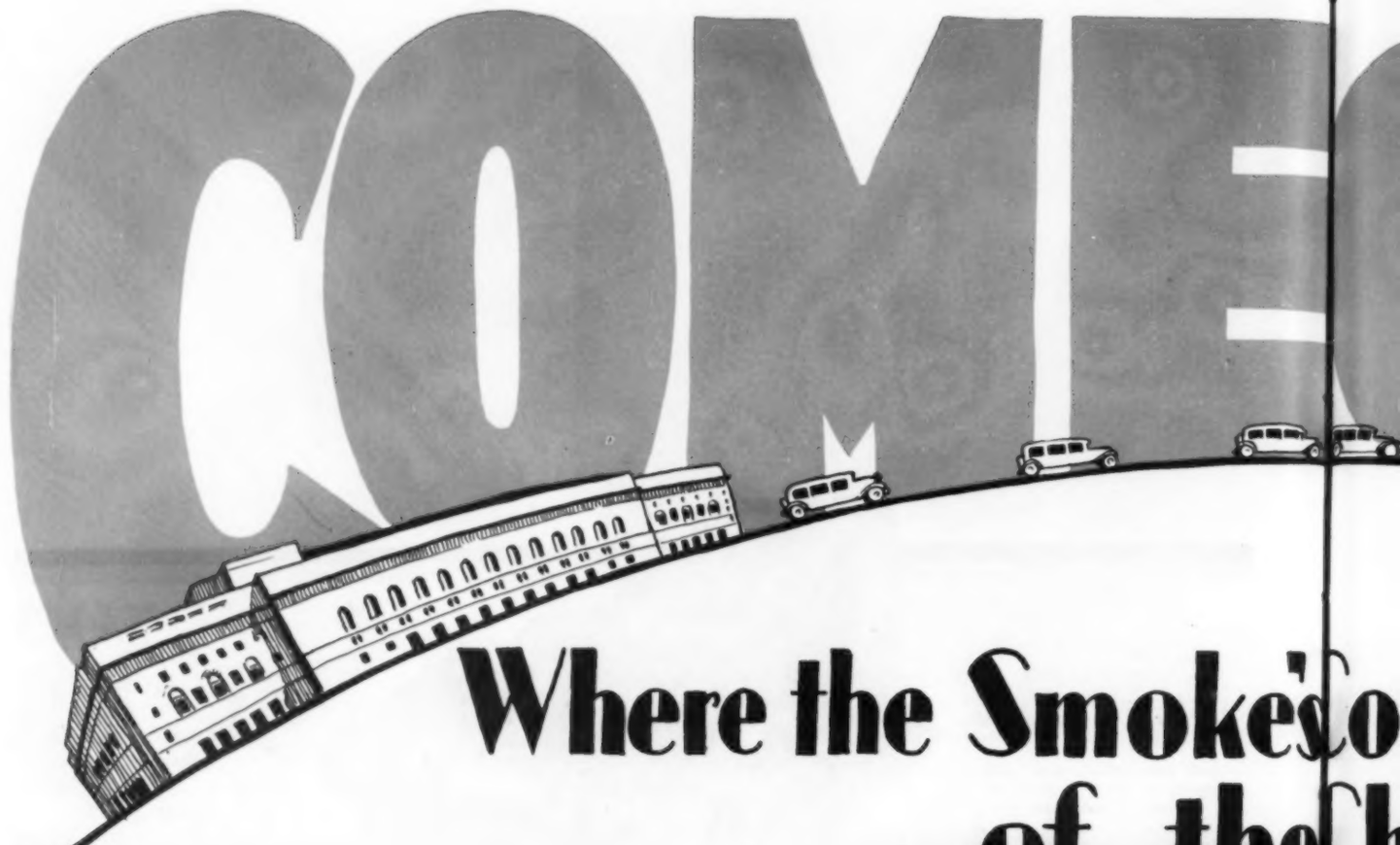
Single and Multiple Drum—Reversible, Non-Reversible and Conveyor Types—Capacity 500 lbs. at 100 ft. per min. to 4000 lbs. at 200 f.p.m.

Send for catalogue J and valuable Hoist Manual

THE BROWN CLUTCH CO., Sandusky, Ohio, U. S. A.

BROWN
SINGLE & MULTIPLE DRUM – REVERSIBLE
GIANT-LINE
NON-REVERSIBLE AND CONVEYOR TYPES
HOISTS

HOIST SPECIALISTS FOR 24 YEARS



COME

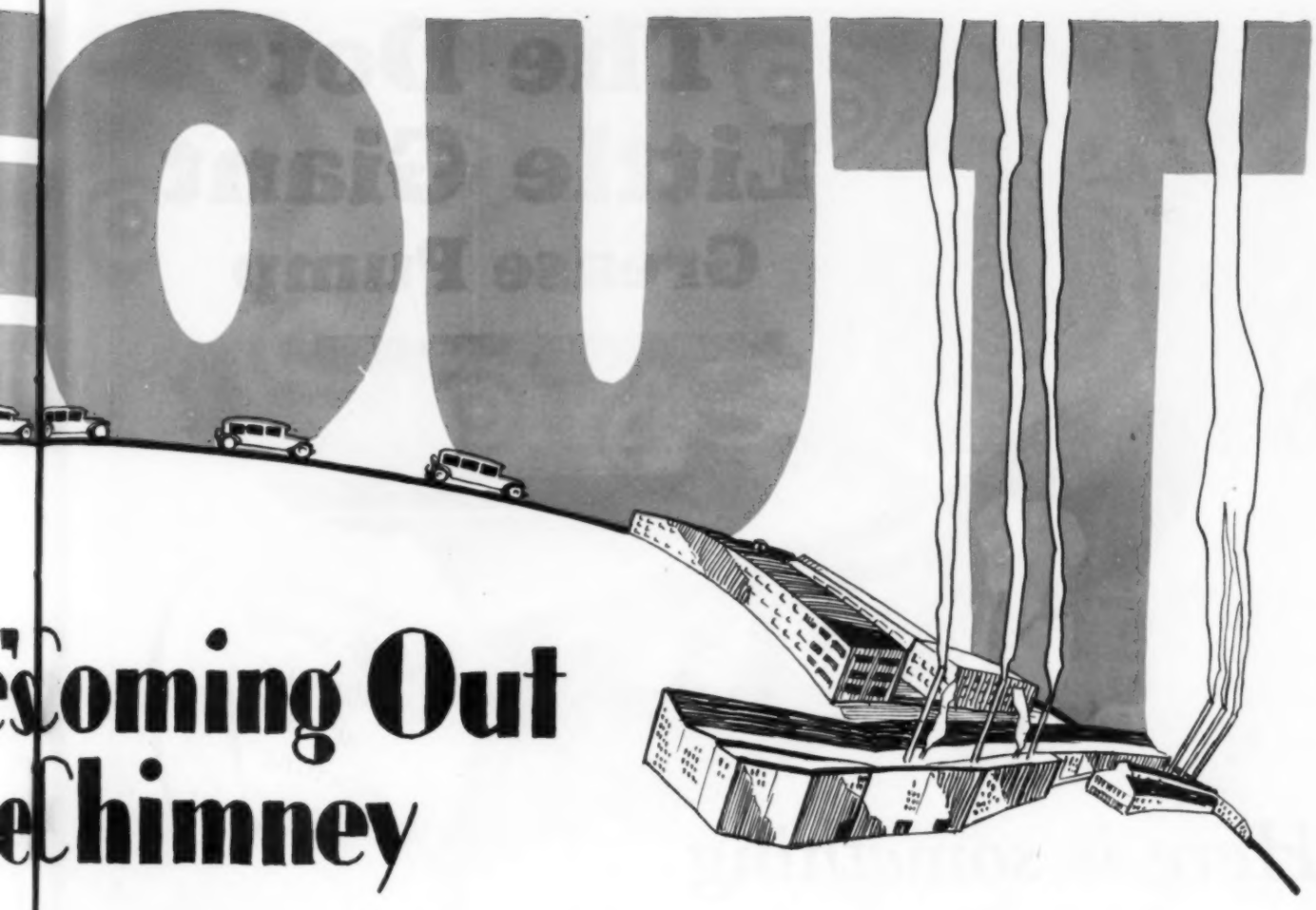
Where the Smoke's Co
of the Ch

WE'D like to get together with all who attend the 26th Annual Road Show at Cleveland's Public Hall. Come out and see us while the smoke's coming out of the chimney.

It's but a few minutes' ride to our plant. Arrangements have been made to transport you by automobile quickly and comfortably. Your reception will be cordial.

You'll see our plant just as it runs every day. View our modern laboratory—one of the finest in the country. See Cleveland Rock Drills, Paving Breakers, Clay and Trench Diggers in repose and in action.

CLEVELAND ROCK DRILLS



'Coming Out
eChimney

We'll show you the details of design and construction. Cleveland labor saving performance will be shown by actual "on the job" demonstration.

Cost reduction is a vital factor in your business as it is in every business. After watching Cleveland tools at work you will readily understand why their record shows a saving, over hand methods, of 50% to 75% on practically any job. Learn how Cleveland Tools can save *you* money.

We'll make your trip interesting and profitable. It will be time well spent for all of us. Let's have a friendly chat and get to know each other better.

Come Out!

THE CLEVELAND ROCK DRILL CO.

3734 East 78th Street, Cleveland, Ohio

The Dot Little Giant Grease Pump

Here is something for you road builders . . . .

$47.50

Price Complete

Something worth looking over while you are at the Road Show!

Something worth getting the facts on if you use any kind of heavy outdoor construction machinery.

Because it solves the lubrication problem, and solves it permanently and cheaply.

Here is a one-man operated grease pump. Light in weight and holds enough grease to do a complete job of lubricating the biggest machine you have on the job.

Develops 7,500 lbs. grease pressure on the bearing—and operates with one hand. That's the kind of thing you need to save and serve your costly power shovels, tractors, ditchers, graders and other construction machinery. Adapted for standard Dot, Alemite and Zerk fittings.

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DIVISION OF CARR FASTENER COMPANY

33 Ames Street, Cambridge, Mass.

DOT REPRESENTATIVES ARE LOCATED IN PRINCIPAL CITIES

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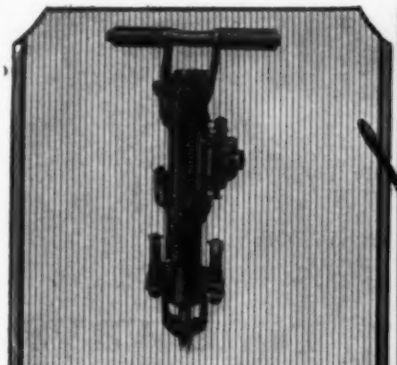
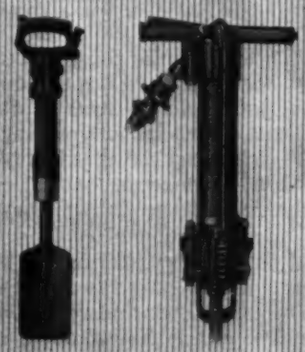
DOT *POSITIVE* LUBRICATING EQUIPMENT COMPLETE



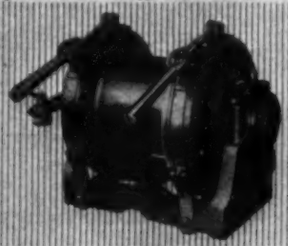
ROTATOR ROCK DRILLS

Rotators are available in many models for any rock drilling encountered in highway or street construction. *Catalog 81-S.*



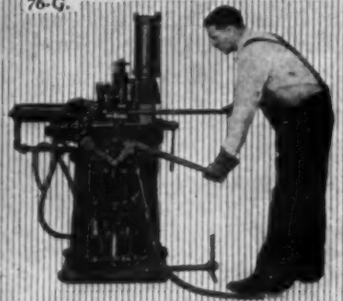
CLAY SPADERS AND CONCRETE BREAKERS

Clay Spaders on small trenching jobs and in tight places will save ¼ your clay digging labor. *Catalog 81-N.* New "K-3" Buster has just the right speed and blow for smashing concrete. Easy on air, easy on the runner—yet powerful and rugged. *Catalog 81-T.*



PORTABLE HOISTS

For pipe laying, handling spoil buckets, and moving cars and material, use a Sullivan Hoist. 345-lb. models lift a ton on single line. Air and Electric hoists are available. *Catalogs 76-F, 76-G.*



PORTABLE ALL HAMMER DRILL SHARPENER

If you are using two hammer drills or more, this 1100-lb. sharpener will make money for you. It runs from your portable compressor without cutting down the pressure on your air tools. *Catalog 72-L.*

At the Road Show—

Sullivan Equipment Points the Way to 1929 Profits

THE business outlook for 1929 is good. Road building, water supply, and sewer programs appear larger than ever.

Many contractors will make large profits. They will shorten the time on contracts; and crowd more business into the year. For they will make every use of good tools to help good men do more work.

At the Road Show in Cleveland you will see new Sullivan Rotators—Concrete Breakers—Clay Spaders—Portable Hoists—and Portable Drill Sharpeners. They will help you to make more money in 1929.

But keep them and their operators "stepping lively" with the most dependable air power you can buy—*Vibrationless Compressors.*

If you can't come to the Show send for the Road Show Booklet, "Speed Up with Air."

Sullivan Machinery Company
168 S. Michigan Ave., Chicago, Illinois

NEW YORK ST. LOUIS DENVER SPOKANE
PITTSBURGH DULUTH SALT LAKE SAN FRANCISCO

SULLIVAN TRADE MARK

ANOTHER JOB THAT CAREY DOES...

Wrinkle-proofing roadways

...that you may drive in peace!

"NOW I can let her roll!" you exclaim as you come to a long, level stretch of concrete highway, for you know from experience that, with concrete under the tires, the car will glide along as smoothly as a canoe on a placid stream.

Give her a little more gas . . . there'll be no bumps, no thank-you-marms, no jiggety-joggety . . . for, winter or summer, wet or dry, it's always smooth sailing on concrete!

You've noticed those narrow, black ribbons that run across the road every thirty feet or so? Of course. Well, those are Expansion Joints, and, if they weren't there to allow for cold-weather shrinkage and hot-weather expansion, your beautiful concrete road would be full of detours in a season or two.

One of Carey's many jobs is to make these tough, ever-wearing, self-adjusting cushions that keep concrete from gaping and buckling and breaking under cold and heat — that keep the wrinkles out of roads.

A simple thing, you say, this Expansion Joint idea! And so it is, but in developing and introducing it Carey has made good roads better!—and that, you'll agree, is a very Big Thing indeed!

And into those insignificant-looking, black strips went 54 years of experience and research and *work*—and those, too, are Big Things when you stop to think of it.

Concrete roads, as you know, are really just beginning to be used—but already Carey Elastite Expansion Joint cushions upwards of 50,000 miles of them *. . . enough clean, smooth highway to twice girdle the globe!*

And this business of road-cushioning is just one of many ways in which Carey contributes to your comfort.

Some of them are extraordinary and all of them are interesting. From time to time we will tell you more about them in these pages.

In the meantime, you might give Carey a grateful thought as the little black road-ribbons go whizzing under the flying wheels of your car.

THE PHILIP CAREY COMPANY, *Lockland*, Cincinnati, Ohio

Philip Carey Products

Homelite announces

the self priming pump

Portable by hand —weighs 75 lbs.

A two purpose pump . . . .

for Seepage
1 gal. per hr.

for Volume
—or 6000 gal. per hr.

See it at the Cleveland Road Show, Jan. 14-18

Pumps the hole dry and keeps it dry.

Distributors for demonstration, service and sales in principal cities throughout the world.

The Homelite Corporation . . . Port Chester, New York ⊕3156

See the NEW ONE

THERE is a big surprise for you in Cleveland—in Booth 8, Central Armory. Here you will see a new advanced type of fast, full-revolving, convertible excavator that is a knock-out. This machine weighs around 13 tons, with full crawler mounting and steel cab. Propelling speed —1¼ miles an hour.

It has the shortest tail-swing of any full-revolving machine on the market.

Bucket attachments available are shovel, clamshell, drag line, trench hoe, and skimmer. Capacity, ⅜ - ½ yard.

Some special features: E-Z lever control for all clutches, all shafts on the revolving base mounted in either ball or roller bearings, propelling mechanism with absolutely no square jaw clutches on the machine.

We will also have on exhibit the Bay City Tractor Shovel and the Bay City Model "R." This new machine completes our line and places us in a position to serve contractors with a class of equipment that is hard to match for speed and economy.

Bay City
Tractor Shovel

Bay City Model "R"
full Revolving Shovel

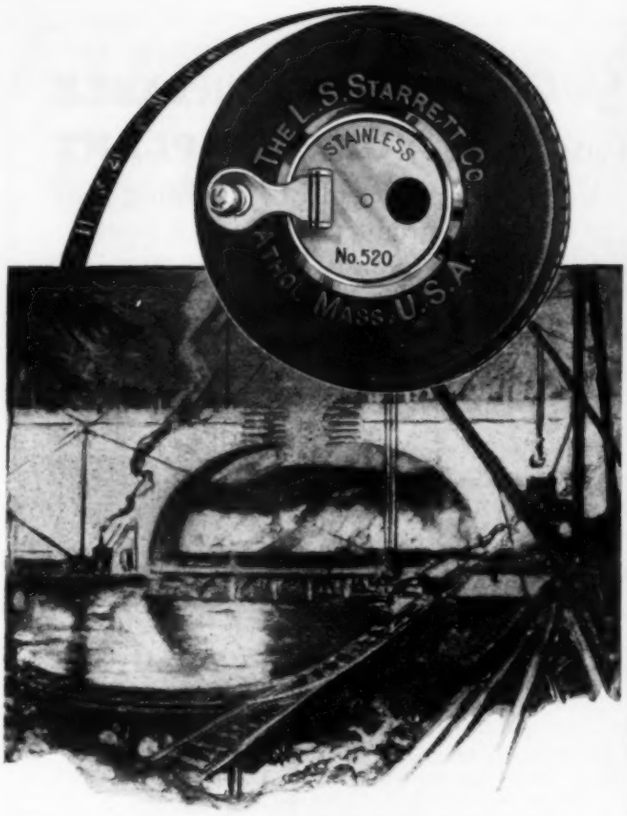
TIMKEN BEARING EQUIPPED

At the ROAD SHOW
BOOTH No. 8
CENTRAL ARMORY

BAY CITY DREDGE WORKS
Bay City, Mich.

BAY-CITY

TRACTOR SHOVELS TRENCHERS SKIMMERS



Look at this tape

Ask your dealer to show you a Starrett Stainless Steel Tape. See for yourself what a strong, handsome Tape it is—and keep in mind that it does not rust. You can use it anywhere, any weather. It's always as good as new.

No. 521 graduated in feet, tenths and hundredths; No. 520 in feet, inches and eighths—both in 50 and 100 ft. lengths.

See them!

Let us mail you a free copy of Starrett Catalog No. 24 "NF."

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World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

Starrett Transit No. 99F

Starrett Transit No. 99F is a simple, moderately priced instrument that can be accurately operated by any practical man. Complete with telescope, extension legs, ground level vial and handy wood case it costs only $40. Let us send you our Transit Book.

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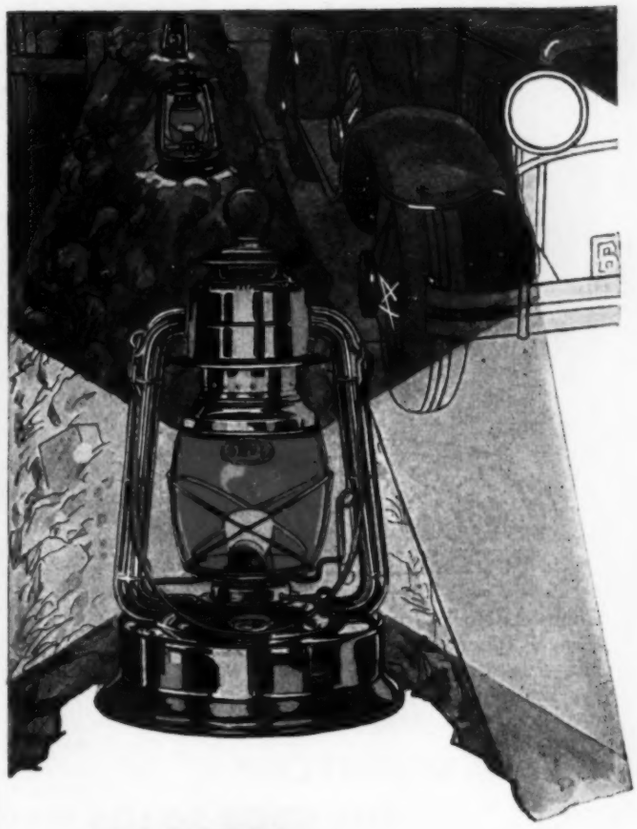


DIETZ LITTLE GIANT Burns 70 Hours Without Refilling

SAFER for all concerned to use Dietz Red Globe Lanterns, whose light says "KEEP AWAY" in language universally understood—and instantly obeyed.

Dietz Cold Blast "Little Giant" Lanterns, with red globes, are highly dependable for this work. They burn 70 hours without refilling—over a week end or holiday.

Use RED! No Other Color Means Danger!

Try "Little Giants." Get them from your dealer.

R. E. DIETZ COMPANY
NEW YORK

Largest Makers of Lanterns in the World

Founded 1840

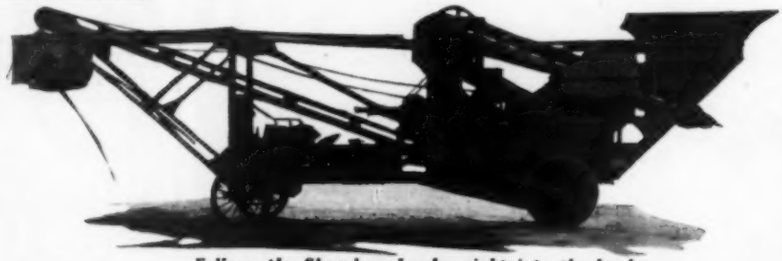
DIETZ LANTERNS

Good Roads PORTABLE (and mobile) GRAVEL PLANT

A complete gravel plant—screening and grading the product to required sizes—A Champion No. 1030 Roller Bearing Reduction Crusher takes care of all oversize material. Capacity when pit run averages 50% oversize—50 to 60 tons per hour.

Good Roads MACHINERY

Complete Rock Crushing and Sand and Gravel Plants—any capacity. Crushing—Elevating—Conveying and Washing Equipment. *Also*—



Follows the Shovel or Loader right into the bank.

Motor Graders—Motor Road Rollers—Bituminous Distributors—Snow Plows

EXHIBITORS—
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- The American Road Builders Convention
- The National Crushed Stone Convention

CLEVELAND OHIO JANUARY, 1929

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KENNETT SQUARE, PA.

Philadelphia
New York City
Watertown, Mass.
Pittsburgh
Chicago

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Cleveland, Jan. 14 to 18

The Buffalo-Springfield Roller Co.
Springfield, Ohio

BUFFALO-SPRINGFIELD

BULL FROG WHEELBARROWS

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This Bull Frog No. 42, the outstanding general purpose barrow, handles maximum loads with minimum effort because of the exclusive features of design and construction engineered into it. Other Bull Frog barrows, carts, and scrapers for every mill, mine, contracting, and industrial use. Write for Catalog.

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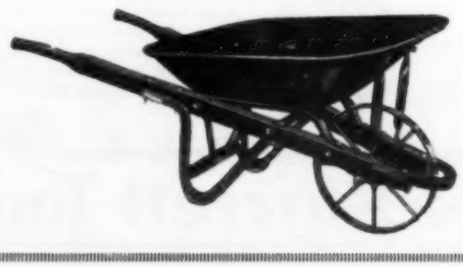

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Get This Latest Information On Your Chosen Field

INFORMATIVE
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INTERESTING

PACKED within the pages of this handy treatise is complete usable information on the latest and approved method of curing concrete streets and roads.

Curing Concrete Highways contains just the kind of material every wide awake road man needs to keep abreast of the times. Shows how to ***save time, trouble and money*** on highway jobs. A complete non-technical discussion of modern methods, illustrated with photographs of actual construction.

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HAUCK OIL BURNING WATER HEATER

(Burns Kerosene or Furnace Oil)

Heats 300 gallons of water per hour from 40° to 180° F. Water at 180° F. three minutes after starting and continuous thereafter.

Write for Bulletin No. 2004 on Concrete Heaters, Thawers, Salamanders and Water Heater.

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Kindly send me a copy of your 1929 Price List.
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THE speed, versatility, rugged construction, big yardage and low cost of the Fundom combination shovel, ditcher and crane, make it a sensational performer and money saver.

It makes small jobs profitable. Fast, full ¾ circle swing, 1/3 yard dipper capacity, 16½ foot radius, gasoline power.

With Trench Hoe attachment for ditching or Boom Extension for clamshell, dragline or crane, the Fundom is an unbeatable three-in-one digging machine.

Get the details and name of nearest dealer. Address—

The Fundom Hoist & Shovel Co.
407 American Bank Building, Lima, Ohio

Spring Mounted Jaeger Mixers *for* Longer Life!

Send Today for your Copy of Jaeger's Big Catalog— New Low Prices

One Bag Timken Bearing Tilter at *the Usual Half Bag Price*

HERE'S a mixer that fits your money-making plans for 1929. It starts at the right price—a big saving. It's built to deliver more batches a day, every day of the year. Timken bearings, steel and forgings don't break down on the job. Jaeger's "Flat Spot" Drum, Accurate Measure Water Tank and Skip Shaker help mix better concrete faster than any other mixer on the market.

More than 100 Jaeger service stations can give you quick, reliable service anywhere. Standardize on Jaeger for lower mixing costs and longer profits.

SPEED QUEEN Mixer *$200 under the Market*

THE fastest, stoutest, most compact mixer built on four wheels. All steel (50% stronger, ⅓ ton lighter), rides on springs, measures up to the famous SPEED KING for speed on the job. Has one man control, 100% ball bearing rollers and countershaft, husky 2-cylinder Le Roi for power.

The SPEED QUEEN is also built in low charge type. Get our prices and full description. It's a winner!

Automatic Skip Shaker

(which shakes loader clean without pounding), all-steel construction, the best in bearings and equipment—you get them all when you buy a Jaeger.

Jaeger Tilters with loaders, 3½, 5, 7, 10, 14 Ft. Sizes. Non-Tilters up to 28 Ft. Trailers, $169 up.

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Please send catalog, prices and terms on

☐ NON-TILT MIXERS ☐ TILTING MIXERS
☐ PLASTER MIXERS

Name_____

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COLUMBIA CALCIUM CHLORIDE

Profitable!

In Concrete Road Building

You are sure of satisfactory results every time you use "3-C" Calcium Chloride for curing concrete.

This method is practical—economical—efficient. It improves strength and quality—saves time and money.

Tests conducted by many authorities, and actual results in the field, are convincingly in favor of Calcium Chloride for curing concrete.

The "3-C" method permits opening a new concrete road in 7 days—a saving of 14 days over old methods.

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"3-C" Calcium Chloride is an effective aid in cold weather construction. It hastens the "set" and consequently shortens the time when protection must be maintained. It assures work of better quality.

Take Advantage of Our Technical Service

Experts in our technical department are able to give you the advantage of much valuable data and information on concrete curing, road building and road maintenance. Please feel free to call on us for this service.

By all means let us send you literature explaining the use of "3-C" Calcium Chloride. Use the handy coupon.

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COLUMBIA CHEMICAL DIVISION,
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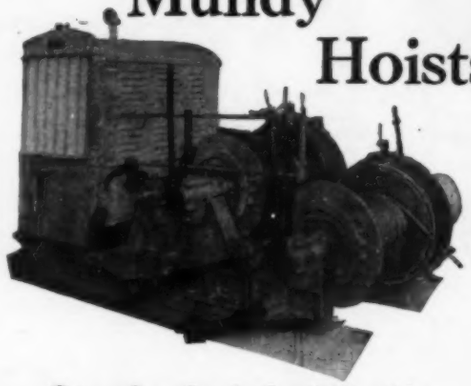

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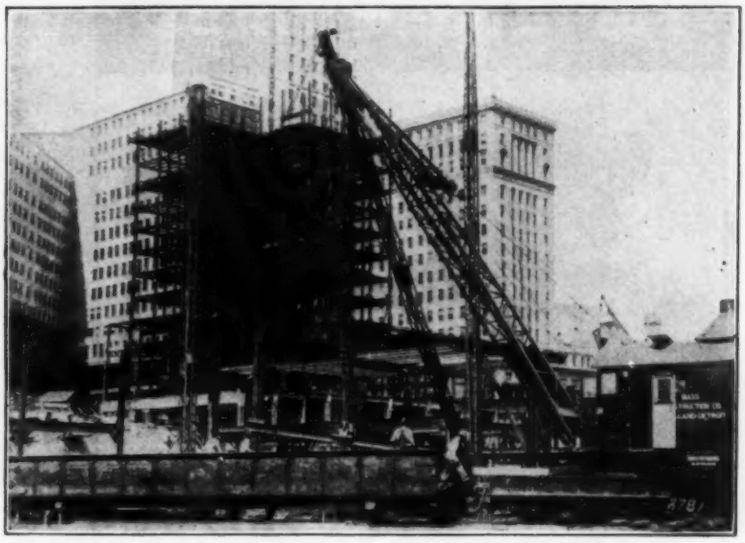

A Browning Locomotive Crane handling steel work on the Cleveland Union Terminal Tower.

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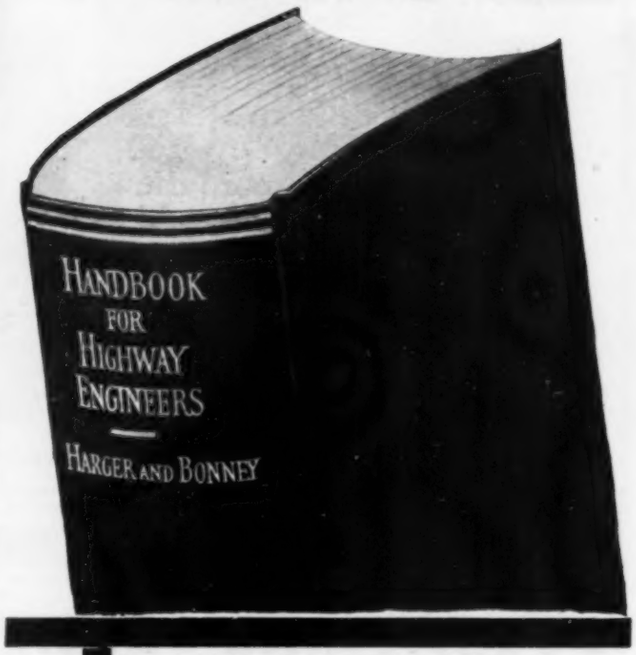

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Information Ordinarily Used in the Design and Construction of Rural Highways

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THIS new Fourth Edition gives you latest data, newest developments, best present-day practice, up-to-date cost data. Of special importance is the new material, for instance, on the protection and elimination of railroad grade crossings. See the tables of most common use which are printed on special colored paper for ready reference.

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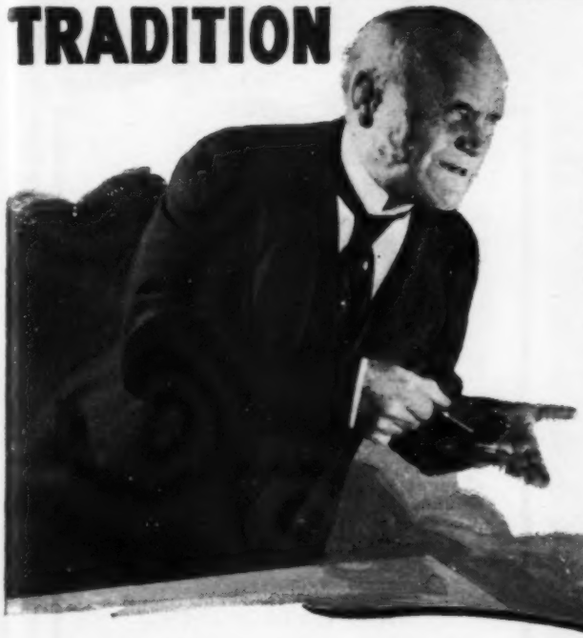
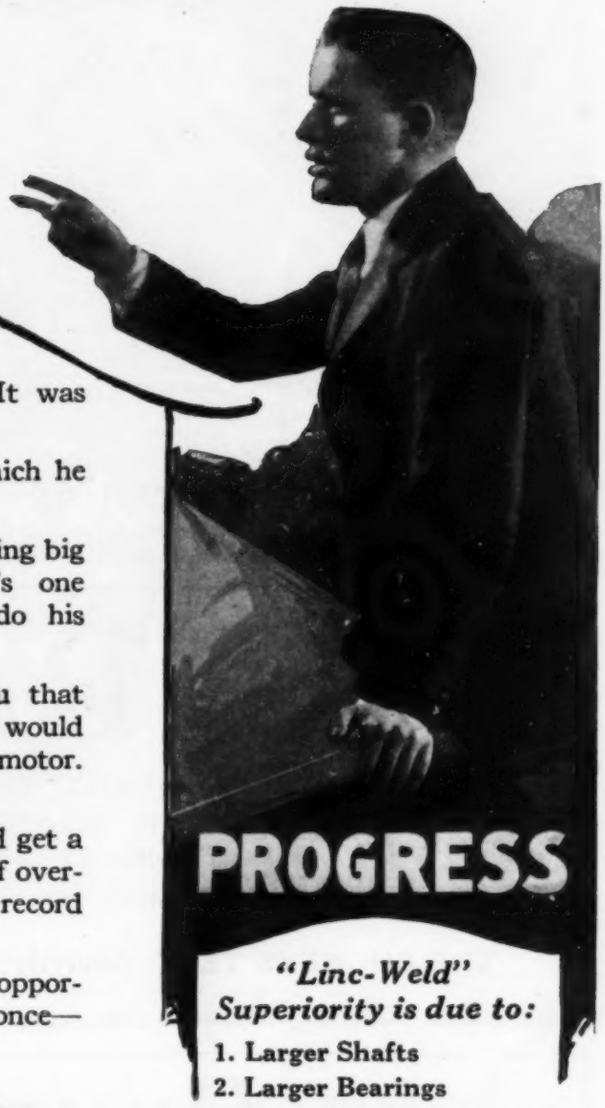


"Here, Lad . . .

the old fellow who sells me the motors we're using on our machines was here today.

I told him that a couple of my friends had changed over to 'Linc-Weld' motors and that they liked them immensely.

That gave him his opportunity to knock."



"No, Pop . . .

that was not his opportunity. It was his habit.

Did you note the distinct order in which he delivered his knocks?

First, I'll bet he knocked the idea of using big shafts and bearings — because that's one reason why 'Linc-Weld' motors outdo his motors on performance.

Then, I'll wager he tried to tell you that Lincoln permanently plastic insulation would eventually dry out the same as on his motor. It won't — it CAN'T.

Then the 'Linc-Weld' steel frame would get a blow or two — but of course he'd lay off overload capacity because that's a matter of record in favor of 'Linc-Weld'.

But as I said before — it wasn't his opportunity because opportunity knocks but once — he does it all the time."

PROGRESS

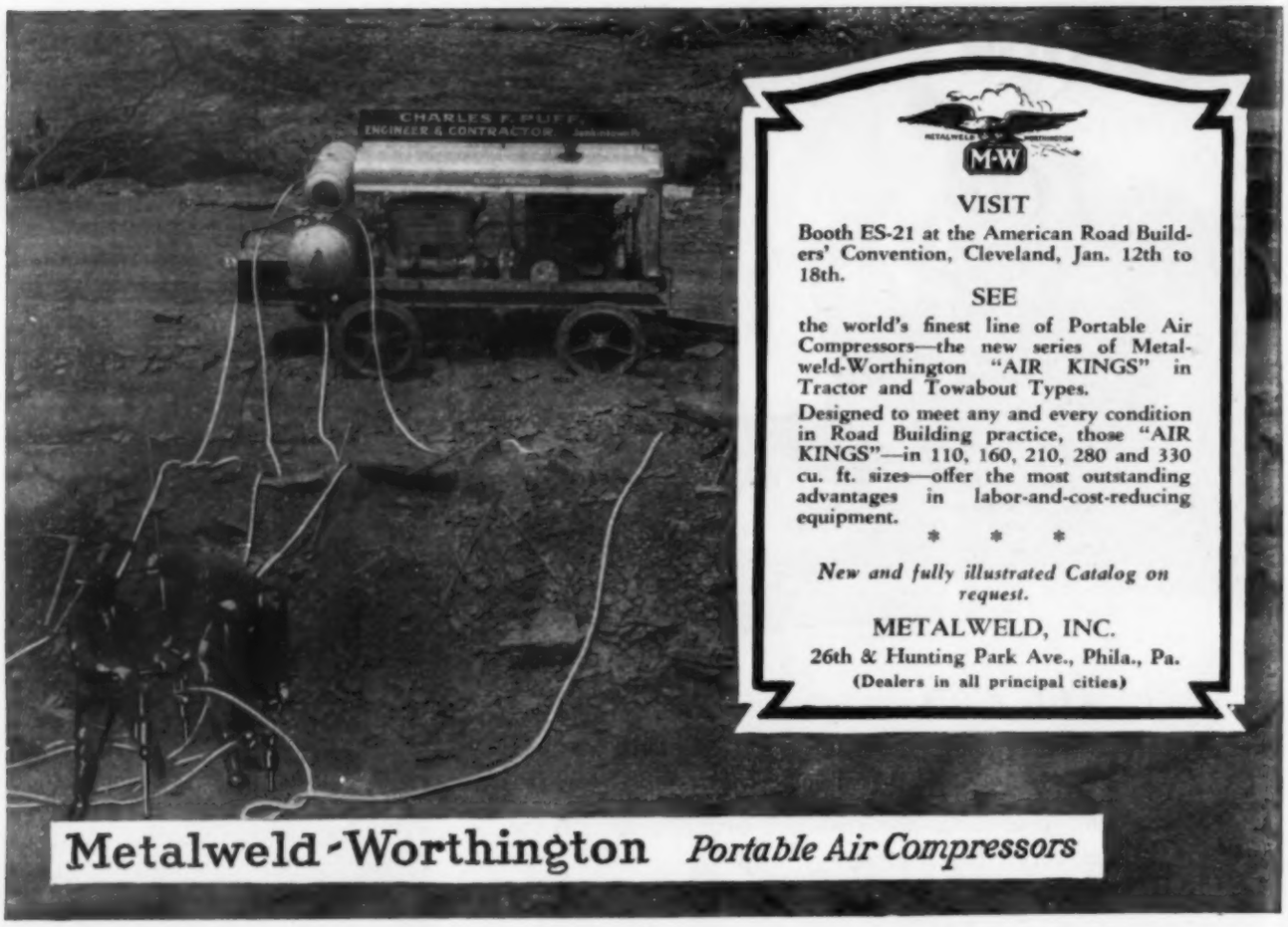
"Linc-Weld" Superiority is due to:

1. Larger Shafts
2. Larger Bearings
3. Better Insulation
4. Stronger Frame (Steel)
5. Greater Overload Capacity

The Lincoln Electric Co.,
Dept. No. 32-1, Cleveland, Ohio

"Linc-Weld" LINCOLN MOTOR

M-31



M-W

VISIT

Booth ES-21 at the American Road Builders' Convention, Cleveland, Jan. 12th to 18th.

SEE

the world's finest line of Portable Air Compressors—the new series of Metalweld-Worthington "AIR KINGS" in Tractor and Towabout Types.

Designed to meet any and every condition in Road Building practice, those "AIR KINGS"—in 110, 160, 210, 280 and 330 cu. ft. sizes—offer the most outstanding advantages in labor-and-cost-reducing equipment.

* * *

New and fully illustrated Catalog on request.

METALWELD, INC.

26th & Hunting Park Ave., Phila., Pa.

(Dealers in all principal cities)

Metalweld-Worthington *Portable Air Compressors*

TARPAULINS

MADE OF HEAVY MATERIAL, THOROUGHLY WATERPROOFED, DOUBLE STITCHED SEAMS, REINFORCED PATCHES WHERE STRAIN COMES AT GROMMETS AND ROPES

ALL GRADES AND SIZES IN STOCK, CAN MAKE IMMEDIATE SHIPMENT

THE BUCKEYE TENT, AWNING & MFG. CO., Spruce and Dennison Ave., Columbus, Ohio

HUMDINGER PUMPS

Non-clogging, everlasting rubber ball valves, totally enclosed, running-in-oil jacks, bronze bushed bearings, all steel trucks, and enclosed engine crank cases make HUMDINGER PUMPS.

THE CONTRACTOR'S CHOICE

Full detail description given in Bulletin No. 1034 CM. Send for a copy.

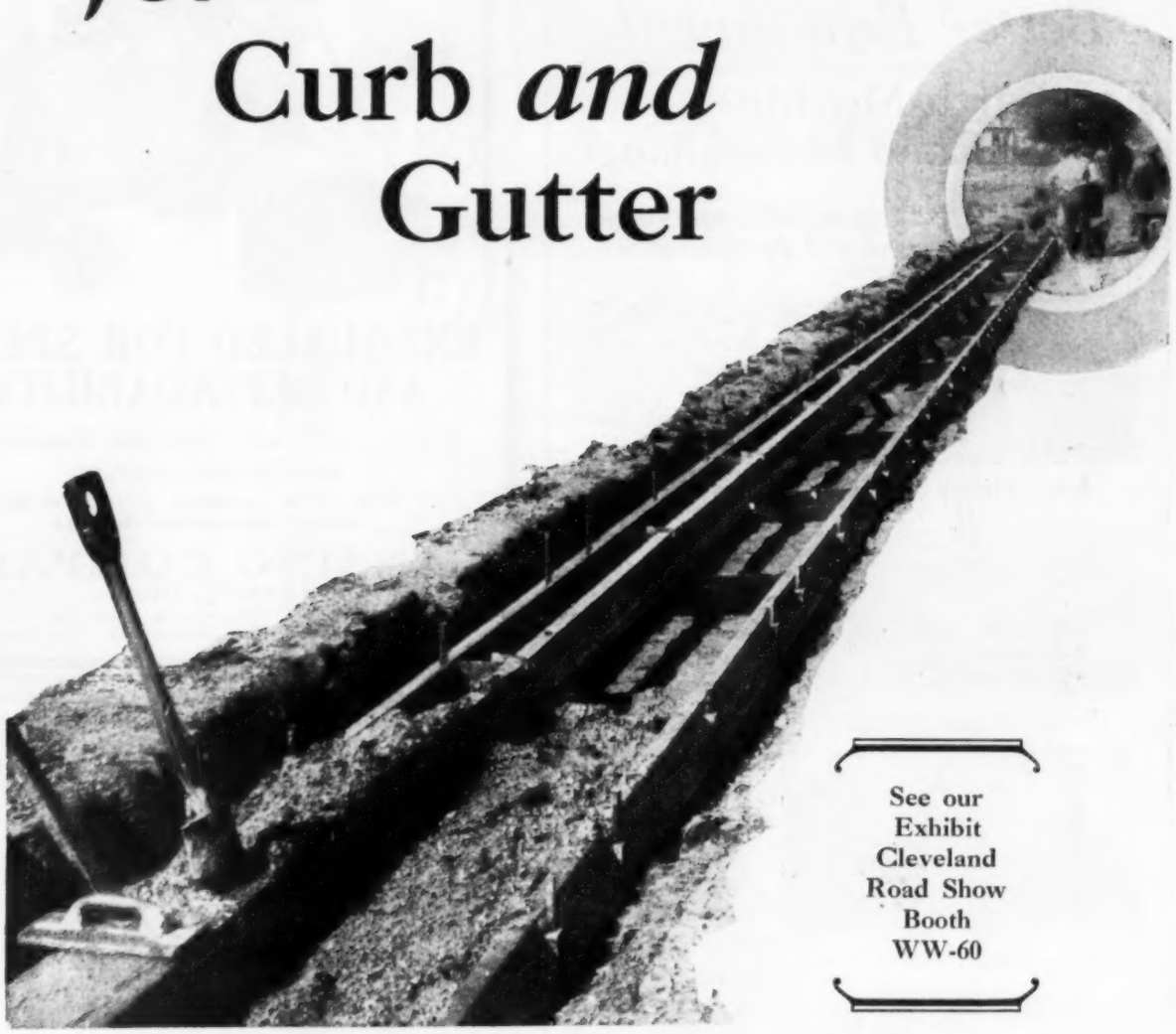
RALPH B. CARTER CO., 126 Chambers St., New York

Factory: Hackensack, N. J.

METAFORMS

for

Curb *and* Gutter



See our
Exhibit
Cleveland
Road Show
Booth
WW-60

PRACTICALLY the same outstanding features that have put miles and miles of Metaform-built highways on the map are also features in the Metaform curb and gutter forms for city streets.

Secure stake anchoring, the sturdy construction of rails, and various members, the simple and thoroughly effective means of locking the pieces together are common to both forms.

The simplicity of assembly and "take down" is even more apparent in the curb and gutter forms but it's an economy that can be counted on whenever Metaforms are used.

A catalog of stock forms for curb and gutter, sidewalk, road rail sent on request.

The Metal Forms Corp., Milwaukee, Wis.

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Better Equipment

For Earth Moving— Road Maintenance

It pays to select dependable equipment with a long record of good service

Baker Maney Scrapers

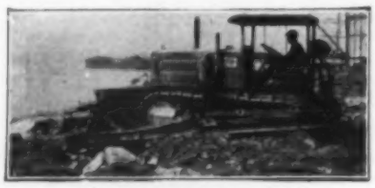
Now made in three sizes—¾, 1 and 1¼ cubic yards capacity. Automatic—Self-loading.

Baker Rotary Scraper

One man, Automatic, for any tractor in four sizes—13 to 40 cu. ft. capacities. One rope control.

Baker Road Maintainer

One man — self-lifting—automatic. Made in three models—9 ft. and 12 ft. widths. Steel or rubber tires. Scarifier attachment.



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Bulldozers and backfillers for leading tractors. Hand and power hydraulic lifts. Powerful — reliable.

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For use with.....tractor

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Baker ☐ Rotary Scrapers

Baker ☐ Maintainers

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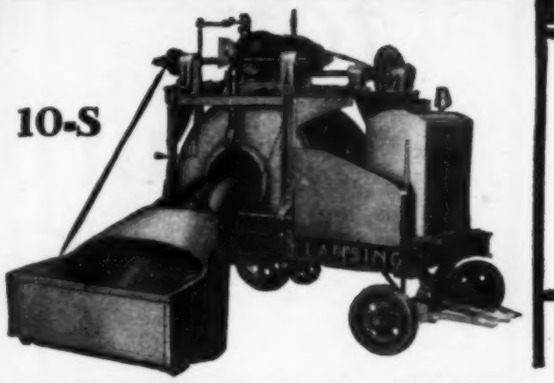
LANSING



UNEQUALED FOR SPEED AND DEPENDABILITY

Thirteen HYATT ROLLER BEARINGS used in this machine

Write us for complete description of this money-making machine

LANSING COMPANY

LANSING, MICH.

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New York Minneapolis Kansas City San Francisco

It's O.K.

with Contractors

—The O.K. Portable Elevator

The O. K. Portable Elevator meets all the requirements of hard, steady service in lifting Brick, Plaster, Steel Members, etc., at low cost in time, labor and money.

And with an O. K., 10-foot sections can be added easily as the job requires.

Powerful, dependable engines; large, sure-grip brakes; ease of control and efficient operation have made contractors all over the country put their O. K. on the O. K. Portable Elevator.

O.K. Portable Hoists

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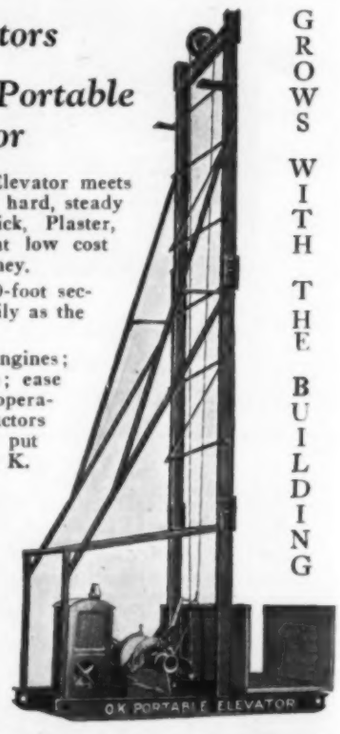

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P. O. Box 305, Columbia, Penna.

Because MEN ATOP THE HILL CAN SEE *two to five years further*

If an engineering staff is to see the paving contractor's needs and wants of tomorrow as they appear on the dim horizon of the industry, it must stand atop the hill.

It must be the originator of today's design so that it need not strive in the humdrum workshop of the valley to catch up with what men on the hill-top could see and anticipate yesterday.

There is no question as to the location of the engineering staff that perfected such a dramatic paver development as the Rex Mechanical Man.

After designing and perfecting such a radical advancement, this engineering staff can retire to its favorite position atop the hill, peering into the dim horizons for the contractor's wants and needs of the day after tomorrow.

CHAIN BELT COMPANY, 764 Park Street, Milwaukee, Wisconsin

REX PAVERS

GOLDEN-ANDERSON VALVE SPECIALTY CO.

AUTOMATIC CUSHIONED STEAM AND WATER-SERVICE VALVES

"We Challenge to Test for Merits Any Automatic Steam or Water-Service Valves in the World"

1330 Fulton Bldg. PITTSBURGH, PA.

A Watson-Stillman Hydraulic Bender Bending Conduit Pipe for Subway Work. Note that but three men are needed in the crew.

DO YOU BEND MUCH PIPE?

If you do you need a
Watson-Stillman
Hydraulic Pipe Bender

These machines are not only rapid and economical of labor, but the bends are made uniform and without danger of buckling or crushing.

We build pipe benders in a variety of types and sizes as well as a full line of Hydraulic Machinery including jacks, pumps, accumulators, presses, shears, etc.

Write for catalogs.

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Making Larger Profits on Excavating Work

A Sauerman Slackline Cableway digs, elevates, then conveys the materials from pit to dumping site in one continuous operation. No pit crew, no separate digging and hauling equipment are needed.

And besides saving you large initial investments in a lot of intermediate handling equipment, the Sauerman Slackline Cableway cuts your payroll charges to the bone—it is operated easily by one man.

Before you get down to brass tacks on your next job, fill in and mail the coupon.

SAUERMAN BROS., INC.
480 S. Clinton Street, Chicago

SAUERMAN BROS., INC., 480 S. Clinton Street, Chicago

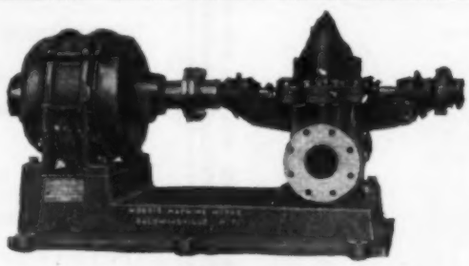
Send me your *Excavating for Profit*, the booklet with illustrations, layout, and information on how other users of Sauerman Slackline Cableways are cutting their excavating costs.

Name.....

Address.....

City..... State.....

Kind of excavating.....



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for handling raw sewage, pulp, trash, liquids holding semi-solids, etc.

These units have surprising ability to pass large solids. They stop the clogging nuisance, are extremely efficient and have extra heavy wearing parts that minimize renewal expenses.

Made in horizontal and vertical types with 3 to 20-in. openings and maximum capacities from 450 to 16,000 gal. per min.

Ask for additional data.

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Originators of Centrifugal Pumps, both single and multi-stage, and builders for practically all purposes since 1864.

New York, Philadelphia, Cleveland, Chicago, Boston, Pittsburgh, Detroit, Charlotte, N. C.

MORRIS
CENTRIFUGAL PUMPS

All Masonry in This Building Laid During Cold Weather with the Aid of "ANTI-HYDRO"

All of the brick masonry in this building was laid in mortar mixed with "ANTI-HYDRO." Most of the work was performed during freezing weather.

In addition to preventing the mortar from freezing, "ANTI-HYDRO" also produced a dampproof job and eliminated the possibility of efflorescence and stains appearing on the brick work from the mortar.

Masonry and concrete work started in mild weather, and caught by a sudden cold snap, can be finished during the cold weather, simply by using "ANTI-HYDRO." This insures early occupancy of buildings by owners, or prompt sale, if they are for investment.

"ANTI-HYDRO" is a liquid integral compound. It combines readily with mortar or concrete mixing water. Easy and economical to use. Permanently hardens and waterproofs concrete *in one operation.* Used continuously for 24 years. Be sure your next job is an "ANTI-HYDRO" job.

ANTI-HYDRO WATERPROOFING CO.

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ANTI-HYDRO
FOR PERMANENT CONCRETE
HARDENS WATERPROOFS

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ARCHTS.— HELME & CORBETT AND C.V.R. BOGERT . . . . . CONTR'S.— HEGEMAN, HARRIS CO., INC. HACKENSACK, N. J.

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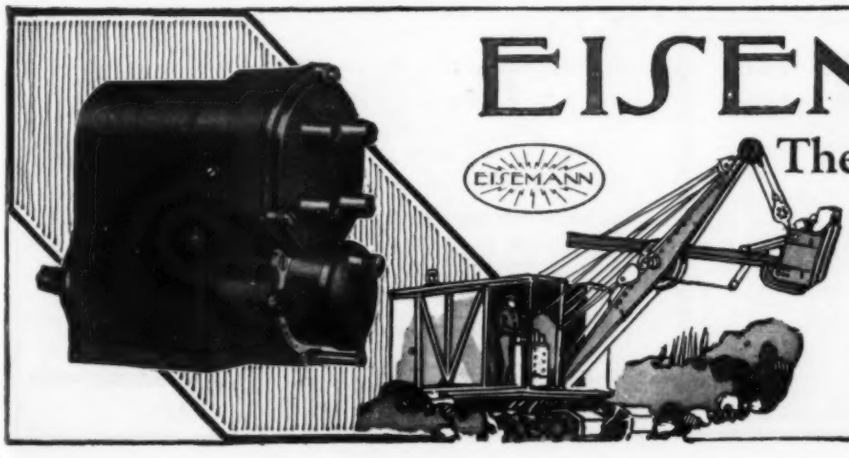
ALL GRADES AND SIZES IN STOCK, CAN MAKE IMMEDIATE SHIPMENT

THE BUCKEYE TENT, AWNING & MFG. CO., Spruce and Dennison Ave., Columbus, Ohio



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The overwhelming choice of the builders of high quality equipment. Favored by contractors everywhere.

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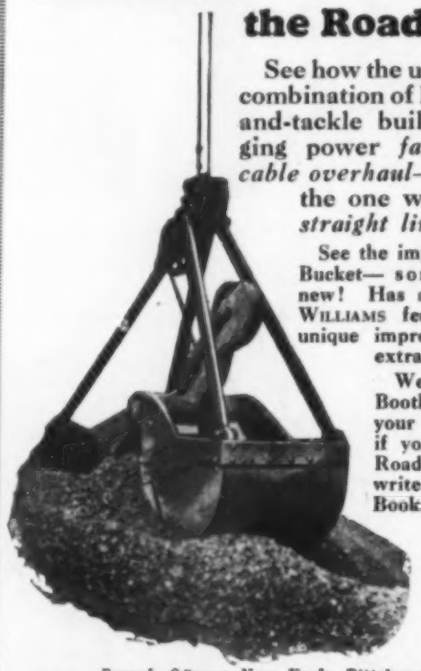
See this at the Road Show!



See how the unique WILLIAMS combination of lever and block-and-tackle builds up the digging power *faster*, with *less cable overhaul*— and does it in the one way that gives a *straight line closing pull.*

See the improved "Universal" Bucket— something entirely new! Has all the well-known WILLIAMS features, with other unique improvements that add extra speed and power.

We'd like you to make Booth No. EH-36-47 your headquarters. And if you can't get to the Road Show this year, write for our Bucket Book.

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FAST-DIGGING BUCKETS

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is probably of more general interest to industry than to any other one subject. Maintenance men, and those who watch maintenance and production costs can take a leaf from the book of experience of thousands of exacting operating men by studying the results of Dixon's Flake Graphite lubrication.

For more than 100 years Dixon's Flake Graphite has been spreading its smooth unctuous veneer over contacting surfaces, reducing friction and wear to a minimum—producing dead smooth bearing surfaces that are so necessary to cool running and long life.

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But be careful where you move and be cautious of the get rich method.

And then, no matter where you move to all that *Construction Methods* needs is your old and new address.

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USE THE COUPON

THE RIGHT TOOL SAVES TIME

. . . For Grading

Here is the finest time and labor saving tool ever designed for light ditching, leveling up the roadbed or other excavations, trimming and grading shoulders. One man with this tool does nearly as much as two men with pick and shovel.

Workmen like the True Temper Grading Hoe because it is perfectly hung, swings easier than a pick, and does more work with less effort.

Blade and eye forged from one piece of high carbon steel, oil tempered. Three and one-half foot selected hickory handle, oval shaped to fit the hand. Blade is 7 inches wide and 7¼ inches deep.

The brand True Temper is burned in the handle to mark each hoe as the best tool of its kind that can be made.

THE AMERICAN FORK & HOE COMPANY
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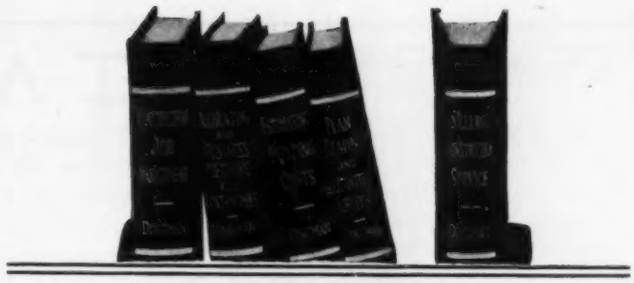
Makers of Farm and Garden Tools for over 100 years.

Branded on the handle of every genuine TRUE TEMPER *tool*

If your dealer has not yet stocked the Grading Hoe, Cat. No. IGH7, send us his name and $2.10 and we will supply you direct; postpaid.

Free on request
Heavy Steel Goods or Industrial Tool Catalog. Describes over 50 tools for mill, mine, factory and coal yard.

TRUE TEMPER TOOLS



The Dingman BUILDING CONTRACTORS' POCKET BOOK LIBRARY

Make your costs come down and your profits go up!

HERE is a set of books that is packed to the covers with plans and methods for saving Time, Money, Materials and Labor. The five books cover every phase of practical construction work from estimating building costs to the selling of construction service—from plan reading and quantity surveying to practical job management. With these books, the contractor and construction superintendent can make costs come down and profits go up!

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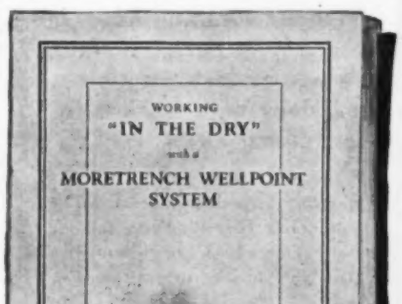
AT ASBURY PARK

the water level is but a few feet under the ground. Owing to silt and clay layers in the sand, all excavations require tongue and groove or steel sheeting and plenty of pumps to help get anything done.

Hall and Carpenter of that city secured a contract for the big, Thatcher building. Eight feet of water to cope with in a twelve foot deep cellar. Waterproofing to be sweat proof. Adjoining buildings to hold up. Mr. Hall reads Construction Methods—and wrote us. Could we handle this situation? We could—and did!

Mr. Hall isn't even sheeting and is digging bone dry stuff. He writes us that they "cannot see how they could have made this excavation without spending $8000.00 more than your system cost us."



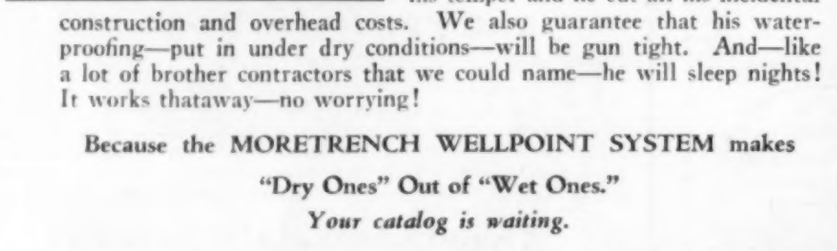
We will add for him that he not only saved this money, but he saved his time, his temper and he cut all his incidental construction and overhead costs. We also guarantee that his waterproofing—put in under dry conditions—will be gun tight. And—like a lot of brother contractors that we could name—he will sleep nights! It works thataway—no worrying!

Because the MORETRENCH WELLPOINT SYSTEM makes

"Dry Ones" Out of "Wet Ones."

Your catalog is waiting.

MOORE TRENCH MACHINE CO. ROCKAWAY, NEW JERSEY



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4 CYLINDER

MOTOR ROLLERS

Powerful and dependable, quick in action, economical to operate. Made in 4 sizes (5-7-10-12 Tons). Send for Huber Motor Roller Catalog.

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315 E. Center St., Marion, Ohio

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JOBS and MEN—For Plant and Office: Technical, Executive, Operative and Selling: *See "SEARCHLIGHT"*

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OFFERED and WANTED—Contracts, Capital, Plants, Properties, Franchises, Auctions—*See "SEARCHLIGHT"*

For "Opportunities" of every kind: "Think SEARCHLIGHT First!"

0103

Who's Getting the Big Contracts?

A Monthly Guide to Where the Construction Dollar is Being Spent

Far West

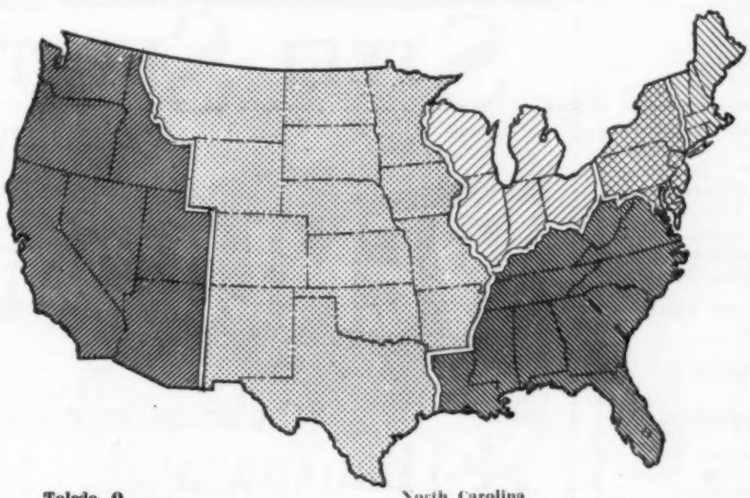
Portland, Ore.
High school: $509,803
H. E. Doering, E. 7th St., Portland.
Westwood, Calif.
Studio: $10,000,000
G. Miller, 101 North Pruess Rd., Beverly Hills, Los Angeles, Calif.
Office & garage: $2,000,000
Lynch-Carmon Eng. Co., Chapman Bldg., Los Angeles.
Mausoleum: $300,000
B. D. Kromrick Co., 3623 Avalon Blvd., Los Angeles.
Portland, Ore.
Apartment: $250,000
E. L. Construction Co., Portland.
Oakland, Calif.
Distributing plant: $200,000
G. Wagner, Inc., 181 So. Park, San Francisco.
Monterey Park, Calif.
Paving: $335,678
G. H. Oswald, 366 E. 58th St., Los Angeles.
California
State Highway: $557,946
Dillon & Boles, 118 No. Crescent Blvd., Los Angeles, and others.
San Diego, Calif.
Causeway: $665,349
Noble & Rhodes, Inc., San Diego.
San Gabriel, Calif.
Flood Control Dam: $11,250,040
Ross Constr. Co.; MacDonald & Kahn; & C. Fisher, Los Angeles.
Oakland, Calif.
High School: $246,294
J. E. Branagh, 184 Perry St., Oakland.
Los Angeles, Calif.
Apartment: $325,000
California Land & Bldg. Co., 3923 W. 6th St., Los Angeles.
Apartment: $250,000
W. Feigenbaum, 322 Union Bank Bldg., Los Angeles.
Nevada
State Highway: $74,669.
J. N. Tedford, Fallon, Nev.
Idaho
State Highway: $63,774
C. A. Robinson, Twin Falls, Idaho.

West of the Mississippi

Beaumont, Tex.
High school: $714,101
McDaniel Bros., Kyle Bldg., Beaumont, and others.
St. Louis, Mo.
Exhibition hall: $1,500,000
Boaz-Kiel Constr. Co., 409 N. 7th St., St. Louis.
Wichita, Kans.
Office: $500,000
Spencer Constr. Co., Spencer, Kans.
Rockdale, Tex.
Paving: $258,006
F. P. McElwrath, Corsicana, Tex.
Edinburg, Tex.
Paving: $1,827,448
W. L. Pearson & Co., 806 Nixon Bld., Corpus Christi, Tex.
Texas
State Highway: $833,644
Lee Moore Constr. Co., El Paso, Tex., and others.
Independence, Mo.
Paving: $269,681
C. H. Atkinson Paving Co., Watertown, S. D.
Iowa
State Highway: $2,175,975
McCarthy Impvt. Co., Davenport, Ia., and others.
Texas
Bridges, State Hy.: $284,811
Austin Bridge Co., Dallas, and others.
Plattsmouth, Neb.
Bridge: $700,000
Union Bridge & Constr. Co., 1205 Midland Bldg., Kansas City, Mo.
Minnesota
Bridge: $151,939
Widell Co., Mankato, Minn.
Iowa
Bridges, State Hy.: $160,081
Wickham Bridge & Pipe Co., Council Bluffs, Ia., and others.
Waco, Tex.
Waterworks: $770,072
W. E. Callahan Constr. Co., Dallas.
St. Louis, Mo.
Parcel Post Bldg.: $200,000
Dwight P. Robinson & Co., Inc., 125 E. 46th St., N. Y. C.
Missouri
Bridges, State Hy.: $178,219
E. E. Hudson, Sikeston, Mo., and others.

Middle West

Oak Park, Ill.
Office & store: $300,000
Dahl-Stedman Co., 11 So. LaSalle St., Chicago.
Chicago, Ill.
Club, store & Office: $3,000,000
McLenna Constr. Co., 307 No. Michigan Ave., Chicago.
Apartment: $1,500,000
C. B. Johnson & Son, 306 So. Wabash Ave., Chicago.
Apartment: $340,000
H. C. Jensen, 6101 Forest Glen Ave., Chicago.
Apartment: $300,000
Morrow & Evans, 244 W. 47th St., Chicago, and others.



Toledo, O.
Hotel: $1,000,000
H. J. Spieker & Co., 1418 Elm St., Toledo.
Cleveland, O.
Apartments: $300,000
M. Berkoff, 3346 Washington Blvd., Cleveland Heights.
Cincinnati, O.
Apartment: $750,000
A. D. Gates Constr. Co., 1611 Chemical Bldg., St. Louis, Mo.
Port Huron, Mich.
Ice plant: $200,000
Bloure & Sinke Co., 33 So. Clark St., Chicago.
Euclid, O.
Factory: $600,000
Austin Co., 16112 Euclid Ave., Cleveland.
Mill: $1,250,000
Austin Co., 16112 Euclid Ave., Cleveland.
Milwaukee, Wis.
Paving: $142,269
Eastern Constr. Co., 878 Franklin Pl., Milwaukee, and others.
Toledo, O.
Paving: $638,024
T. P. Garrigan, Glenwood Court, Toledo, and others.
Youngstown, O.
Bridge: $280,604
Pitt Constr. Co., Pittsburgh, Pa.
Kalamazoo, Mich.
Bank and office building: $1,000,000
O. F. Miller, Kalamazoo.

South

Mississippi
Current retards: $243,240
Woods Bros. Constr. Co., 132 So. 113th St. Lincoln Neb.
Charlotte N. C.
Apartment hotel: $250,000
J. P. Little & Son Builders Bldg., Charlotte.
Richmond, Va.
Hotel: $1,500,000
Wise Granite Constr. Co., Am. Nat'l Bank Bldg., Richmond
Louisville, Ky.
Factory: $125,000
Perro Concrete Constr. Co., Cincinnati, O.
Baton Rouge, La.
Packing plant: $100,000
J. Powers, Baton Rouge, La.
Durant, Miss.
Cold Storage Plant: $50,000
O. E. Lewis Co., Inc., 853 Carondelet St., New Orleans
Parkersburg, W. Va.
Mill: $100,000
Plate Constr. Co., Parkersburg.
Birmingham, Ala.
Paving: $145,216
Dunn Constr. Co., Lincoln Life Bldg., Birmingham.
North Carolina
State Highway: $368,205
N. L. Teer, Durham, N. C., and others.
Lafayette, La.
Schools: $209,127
P. Oliver & Son, Lake Charles, La., and others.
Savannah, Ga.
High School: $277,000
Artley Co., 504 E. Bay St., Savannah.
Hattiesburg, Miss.
Hotel: $500,000
G. M. Gwin Constr. Co., New Orleans, La.

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New York, N. Y.
Piers: $294,400
E. O. Roberts Co., Inc., 52 Vanderbilt Ave., N. Y. C.
Brooklyn, N. Y.
Subway: $2,019,977
C. Petrillo Co., East Chester Creek & Boston Rd., N. Y. C.
Pittsburgh, Pa.
Lock, Allegheny River: $719,035
Atlantic Ellis Channel System, Inc., 33 Rector St., N. Y. C.
New York, N. Y.
College Building: $1,000,000
T. O'Reilly, 415 Lexington Ave., N. Y. C.
Jersey City, N. J.
Warehouse: $4,500,000
Turner Constr. Co., 420 Lexington Ave. N. Y. C.
Newark, N. J.
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Felton Constr. Co., 1450 Michigan Ave., Buffalo, N. Y.
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G. A. Fuller Co., 949 Broadway, N. Y. C.
New Jersey
State Highway: $242,979
C. D. Prosser, Pitman, N. J.
Long Island City, N. Y.
Paving: $200,085
Kordes Contg. Co., 59 Washington Ave., Brooklyn
Marion, N. J.
Bridge pier masonry: $1,000,000 (est. total cost)
Arthur McMullin Co., 50 Church St., N. Y. C.
New Jersey
Bridge, State Hy.: $920,000
Foundation Co., 120 Liberty St., N. Y. C.
Philadelphia, Pa.
Hospital: $1,000,000
Mideast Constr. Co., 50 Court St., Brooklyn, N. Y.
New York, N. Y.
Hotel: $2,000,000
Amsterdam Building Co., 441 Lexington Ave., N. Y. C.
Apartments: $800,000
Bing & Bing, 119 W. 40th St., N. Y. C.
Orange, N. J.
Apartment: $200,000
A. Cassini, 304 Central Ave., Orange.

New England

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Worcester, Mass.
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L. Rocheford & Son, 44 Front St., Worcester.
Danvers, Mass.
Nurses' Home: $150,000
Z. A. Houle, 53 Central St., Lowell.
Chicopee, Mass.
College: $150,000
Daniel O'Connell & Sons, Inc., 480 Hampden St., Holyoke.
New Haven, Conn.
Hospital: $500,000
Hegeman-Harris Constr. Co., 360 Madison Ave., N. Y. C.
Palmer, Mass.
Hospital: $150,000
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Gloucester, Mass.
Bank: $150,000
R. E. Runnels Constr. Co., Lowell, Mass.
Cambridge, Mass.
Church: $150,000
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Boston, Mass.
Office Building: $150,000
George A. Fuller Co., 11 Beacon St., Boston.
Office Building: $150,000
A. Piotti Co., 708 Dudley St., Dorchester, Mass.
Hotel: $150,000
G. Gonia Co., 2 Creek Sq., Boston.
Bridgeport, Conn.
Store: $300,000
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Providence, R. I.
Bank: $150,000
C. B. Maguire Co., Providence.
Worcester, Mass.
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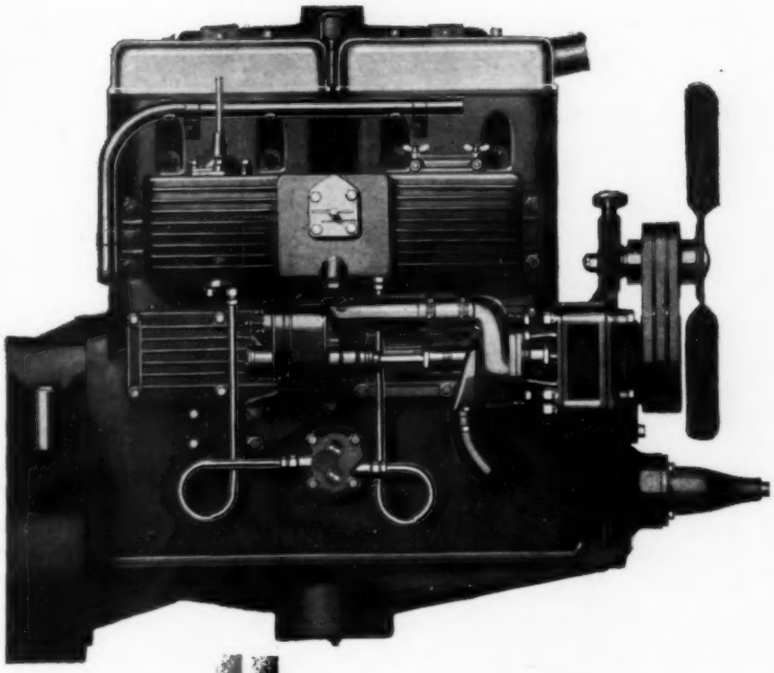

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H2	4	2½" x 4¼"	9-19
H9	4	3⅜" x 4¼"	14-33
W9	4	3⅜" x 4½"	23-40
S5	4	4¼" x 4½"	29-50
S10	4	4¼" x 5 "	
L4	4	4½" x 5½"	23-45
B7	4	5 " x 6 "	35-64
H15	4	4¾" x 6 "	32-70
H16	4	5 " x 6 "	36-75
H21	4	5 " x 6½"	39-81
H22	4	5¼" x 6½"	47-86
H23	4	5½" x 6½"	52-91
H24	4	5¾" x 6½"	60-97
H25	4	6 " x 7¼"	65-120
H26	4	6¼" x 7½"	70-125
H27	4	6½" x 7½"	76-130
H28	4	6¾" x 7½"	82-136
32L	6	2⅞" x 4¾"	12-34
14C	6	3⅜" x 4¾"	16-43
8B	6	3¾" x 5 "	36-70
9T	6	4¼" x 5½"	50-85
28H	6	4½" x 5¾"	65-105
20R	6	4⅜" x 4¾"	27-88
18R	6	4 " x 4½"	25-81.5
P10A	2	3⅜" x 4¼"	8-14
P11	4	2½" x 4¼"	9-19
P20	4	3⅜" x 4¼"	14-33
P27	4	3⅜" x 4¼"	23-40
P35	4	4¼" x 4½"	29-50
P56	6	3¾" x 5 "	36-70.5
P75	6	4¼" x 5¼"	50-85
P96	6	4½" x 5¾"	66-105
P11A	4	2½" x 4¼"	9-19
P20A	4	3⅜" x 4¼"	14-33
P35A	4	4¼" x 4¼"	29-50
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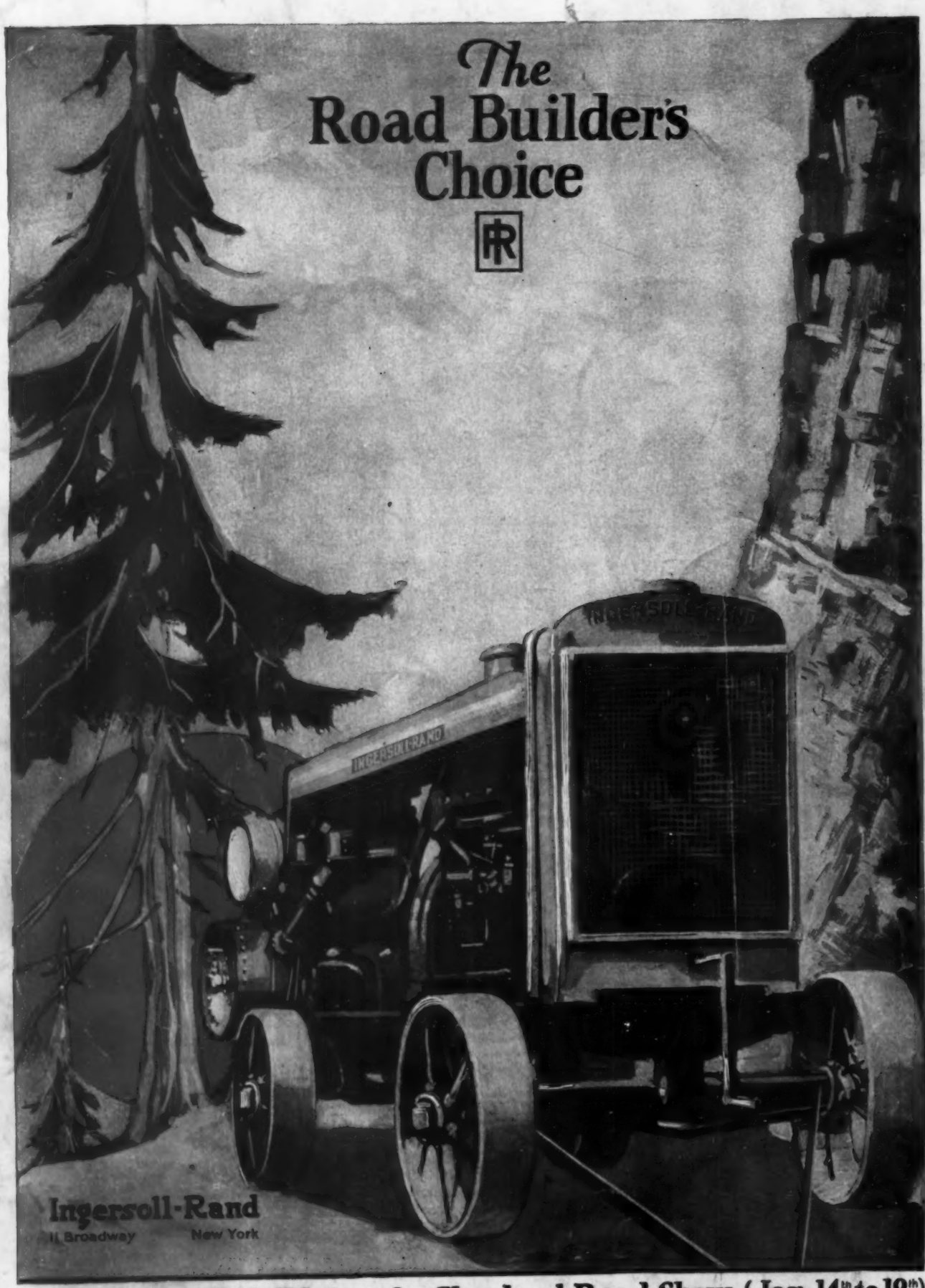

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